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REPORT OF THE WORKING GROUP ON MARINE DATA MANAGEMENT (WGMDM)

9–11 MAY 2005

SOPOT, POLAND

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Conseil International pour l'Exploration de la Mer

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Contents

1 Executive summary

The Working Group on Marine Data Management [WGMDM] (Co-Chairs: Michele Fichaut, France, and Helge Sagen, Norway) met in Sopot, Poland from 9–11 May 2005. The main focus of WGMDM has been on the current (2004) Terms of Reference and on the future structure of the group. The key outcomes from the terms of reference are described below.

Terms of Reference for 2005 (C.Res. 2004/2C07)

Quality assurance/control procedures – Identify and compare existing quality control and quality assurance procedures for physical, chemical and biological data in use at WGMDM member organizations, and recommend common standards and procedures to ICES and IOC/IODE.

The Guidelines were developed to provide consistent advice for managing and exchanging data, including provision of services to users. The present guidelines are complete and consistent and have been promoted to other groups, including IOC/IODE. Future work will include making available and updating the existing guidelines. To ensure this, WGMDM will in particular work together with GE-BICH on biological matters, and seek to collaborate with the IODE quality control project.

Taxonomy issues - Improve usefulness of the Integrated Taxonomic Information System (ITIS) to the marine community and actively promote ITIS within the ICES and IOC communities.

ITIS is the largest, most well organised list of Taxonomic codes and thus has become a de-facto standard, a contributor to the Global Biodiversity Information Facility (GBIF) and recommended by ICES, IOC/IODE and GE-BICH. One of the main advantages of using ITIS was to have a standard list of well-researched names, but it has a North American, non-marine taxa focus. The speed with which non-North American names are added is hampering the use of ITIS as a reference list of names. One of the solutions could be for ITIS to accept lists from other organizations, like the European Register of Marine Species (ERMS) and the North West Atlantic Register of Marine Species (NWARMS). Together, these two lists cover the areas of interest for ICES.

Operational Oceanography issues - Critically assess the data management practices in place in WGMDM member organizations in support of Operational Oceanography.

As operational oceanography becomes increasingly important, WGMDM recommends that well known and recommended data management procedures are implemented. WGMDM will examine currently available procedures and recommend best practice for operational oceanography in the coastal ocean. In addition, WGMDM will provide links to relevant data and products produced by their centres. WGMDM will investigate the quality control procedures used in established Operational Oceanography projects.

XML – eXtended Markup Language - Based on the final report and results of the SGXML, make recommendations regarding adoption of the use of XML in the oceanographic community.

The ICES/IOC Study Group on the Development of Marine Data Exchange Systems Using XML (SGXML) during its three-year existence concentrated its efforts on metadata standards, parameter dictionaries and generic data structures for use in an XML-based language because it soon appeared that XML is an excellent tool for metadata but not for distribution of physical oceanographic data; biological data, which is by nature more verbose, is successfully exchanged by among others OBIS and GBIF. At the IODE XVIII meeting, it was decided that

future XML work and development would continue through the establishment of a MarineXML Steering Group. Some members of WGMDM will participate in the work and keep the rest of the group updated.

GIS Geographical Information Systems - Critically examine the use of GIS in marine data systems in WGMDM member countries, and make recommendations as to the use of GIS.

There are multiple benefits of using GIS and WGMDM recommends it, but acknowledge the need to investigate on Open Source software such as MapServer and to look into existing standards before making further specific recommendations. However, WGMDM can already recommend the use of standards such as ISO-19115 for the Metadata and OpenGIS for the diffusion of geographic objects (WMS = Web Map Service, WFS = Web Feature Service).

Proposed Term of Reference for 2006

According to the discussions taking place at the meeting a rephrasing of some of the existing ToRs and termination of the second ToR were agreed on. Two new ToRs were proposed and the summary of the discussions according to these ToRs are as follows:

Data type guidelines - Assess the continuous development and updating of an accurate list of best data collection guidelines and to recommend on encouraging the use of the guidelines by the scientific community.

WGMDM will compile an accurate list of best data collection guidelines building on the two lists, MDM guidelines and 'other guidelines'. The guidelines will be presented on posters and on different web sites. The information on quality control and guidelines should be channelled through the IODE web sites (e.g., OceanPortal, OceanTeacher).

Future structure – Merge WGMDM with SGMID into a new group of data managers, users, and scientists called the Working Group on ICES Data and Information Management.

WGMDM and SGMID will benefit from meeting back to back next year to agree on the future of the two groups. WGMDM suggests to merge the two groups with the following mission:

- to advise ICES on data management issues;
- to promote good data management practice within ICES;
- to give guidance to the ICES Data Centre;
- to liaise with relevant international data management bodies and programmes (IODE, GOOS, SeaSearch/SeaDataNet, etc.).

The Terms of Reference for the group are a mixture of WGMDM and SGMID ToRs. The Working Group on ICES Data and Information Management will be positioned directly under the ICES Bureau, but will report to the Science Programme through the Oceanography Committee and to three Advisory Committees (ACE, ACME, ACFM) at the Annual Science Conference or in-between whenever appropriate.

2 Opening of the meeting

The meeting, which was hosted by the Institute of Oceanology Polish Academy of Sciences, Sopot, Poland, was opened by H. Sagen and M. Fichaut (Co-Chairs) at 9:00 am on 9 May 2005. Participants were welcomed to the meeting by the Director of the Institute, Prof. Stanislaw Massel. M. Wichorowski also welcomed participants and explained the local arrangements.

Members of the Working Group present were: P. Alenius (Finland), S. Almeida (Portugal), T. de Bruin (Netherlands), G. Dawson (United Kingdom), G. Evans (United Kingdom), M. Fichaut (France), L. Fyrberg (Sweden), MJ. Garcia (Spain), R. Gelfeld (USA), S. Jans (Belgium), A. Joyce (United Kingdom), S. Sagan (Poland), H. Sagen (Norway), J. Szaron (Sweden), E. Vanden Berghe (Belgium), M. Wichorowski (Poland).

J. Gillin, S. Reimert, and M. Sørensen from ICES were also present.

Apologies for absence were received from M. Danielsen (Iceland), R. Eisner (Canada), S. Feistel (Germany), L. Fernand (UK), J. Gagnon (Canada), D. Gregory (Canada), K. Larsen (Faroes), U. Lips (Estonia), G. Moiseenko (Russia), F. Nast (Germany), T. O'Brien (USA), R. Olsonen (Finland), H. Rees (UK), L. Rickards (UK), G. Slesser (UK), S. Tomlinson (Canada), H. Valdimarsson (Iceland).

A complete list of names, addresses and contact points of participants can be found in Annex 1.

3 Adoption of the agenda and review of 2004 action list

The agenda (see Annex 2 for the agenda, Annex 3 for current Terms of Reference) for the WGMDM (see Annex 5 for a list of acronyms) meeting was adopted as a resolution of the 92nd ICES Statutory Meeting in Vigo, Spain (C.Res. 2004/2C07).

M. Fichaut reviewed the Action Items from the 2004 meeting. The status of these is given in Annex 4.

There were 26 action items to be fulfilled; seven of which concerned guidelines made by WGMDM, three concerned ITIS, three had links to XML, three were linked to other ICES working groups or to European projects, one was about the Hamburg meeting on biological data management, one was to assign responsibilities to WG members, one dealt with EDIOS of western Atlantic and one was about the updating of the international current meter inventory. Only two actions were not started, other were either completed or in progress. The actions were discussed under the relevant Agenda Items.

4 Reports of WGMDM members – presentations

Meeting participants described some specific activities at their own centre over the past year. Executive summaries of the presentations can be found in Annex 6.

5 Comment on ICES changes

During last year meeting in Belgium WGMDM was very concerned about the changes that were occurring in the ICES Secretariat, and WGMDM considered it important that the ICES Secretariat be represented at WGMDM meetings since this had not been the case for the last two years.

ICES took these remarks into account and this year three representatives of the ICES Secretariat attended the Sopot meeting. J. Gillin, ICES Data Centre Manager, gave presentations on the changes being implemented in the ICES organisation.

5.1 Data management strategy & business plan

In order to better understand the present structure of ICES, J. Gillin gave a detailed description of the ICES Organizational Structure. The ICES Secretariat currently has 38 employees. The focus of the ICES Secretariat has changed from the previous "Discipline" structure consisting of the Oceanography, Environment and Fisheries sections to the current "Functional" structure based on the Data Centre, Science Programme and Advisory Programme.

She described the Consultative Committee (ConC), chaired by Harald Loeng, which answers directly to the ICES Council and is the parent body to the Science Committees. In addition she described the Bureau Working Group on Data Development Project (BWGDDP) which is an ad hoc Working Group composed of the chairs of the three Advisory Committees (ACE, ACMF, ACME), Chairs of SGMID and WGMDM, the ICES Data Centre Manager, the Head of the Advisory Programme, the Head of the Science Programme and the Chair of ConC. The group is chaired by the First-Vice President of ICES. This BWGDDP reports its work to the ICES Bureau.

5.2 Review of draft ICES data policy

J. Gillin first presented the background of ICES data policy which dates from 1994, and she noted that there have been lots of technological advances since then. None of the key groups of ICES (data contributors, expert groups, external data users, data centre) are happy about ICES data policy, so SGMID was asked by BWGDDP to draft an updated version of a new data policy for ICES.

This draft version of ICES data policy was distributed to WGMDM. The general principles of this new policy are**:**

- Focus has shifted from data submitters to data users (which means that the data at ICES will be in the public domain by default, the submitter has to ask ICES to restrict his data to be public, normally maximum 2 years);
- Speed is becoming a quality factor;
- Absolute quality can be initially less important;
- Secure ICES position as a focal point for marine data in its area.

WGMDM went through the document about the data policy and made some comments to ICES. One general comment is that it should be more operational and easy for people to use, for instance there should be a separation between data providers and data users. It was also suggested to shorten the text and to put details into annexes, and make the first page the most important page.

WGMDM was very concerned about the fact that the speed of data delivery is a main quality factor. A number of the WG members did not agree on its importance and insisted on the importance of quality control of the data.

5.3 User survey on ICES data centre products and services

J. Gillin presented the User Survey of (Potential) ICES Data Centre services users to the WGMDM. The survey outlines the aims to identify data and system needs associated with individual projects conducted by ICES members and non-members.

WGMDM members reviewed the User survey and made the following suggestions to ICES:

- R. Gelfeld, pointed out that IOC/IODE recently dealt with a user survey and he suggested to contact P. Pissierssens from IOC Secretariat and also to have a look at Monkeysurvey.com for online surveys.
- The distribution of the User Survey, for ICES member countries, should go through the chairs of all ICES Expert Groups. They will distribute it to their group members, who then will distribute it within their countries.
- Some rewordings of the User Survey were also proposed.

Report on 2004/2005 actions

Action 8: Request the ICES secretariat to provide and update on their future data management strategy and plans (Chairs)

Action 9: Request the ICES secretariat sends a representative (e.g., Data Centre Manager) to the next MDM meeting (Chairs)

J. Gillin was officially invited to the Sopot WGMDM meeting during the Sea Search meeting, which took place in Hamburg (Germany) in December 2004.

Action 10: Request IODE project officer to attend the next MDM meeting

Dr L. Rickards, Chair of IOC/IODE informed H. Sagen about representation from IOC/IODE and the IOCE/IODE Project office before the WGMDM meeting. Dr Edward van den Berghe is considered the representative of both. He can be listed as a member of WGMDM and not an observer.

Action 11: Send information to the ICES Secretariat of what MDM would like to see on the MDM web pages (H. Parner, R. Gelfeld, G. Evans)

Nothing has been done yet on the Web pages.

WGMDM discussed whether MDM should create its own website which will be linked from ICES Working Group web pages. This would enable MDM to make its own modifications without going through ICES. G. Evans proposed to host these Web pages in BODC.

MDM will have to note and take into consideration that ICES Information managers are working on establishing a new web design tool for ICES groups at the ICES server. MDM will stay in touch with ICES (Neil Fletcher) about this and will respond to relevant developments. R. Evans will shut down the Yahoo group website and transfer all relevant information too the new pages.

The content of the WGMDM website should be:

- A list of the members;
- MDM guidelines and list of other guidelines;
- A link to last year report on ICES website;
- A link to the SGXML report;
- A link to other relevant reports SGMID, BWGDDP;
- The photo album;
- The copy of the presentations of last year meeting;
- The list of the CD-ROMS and products available in members institutes.

Action 24: Try to involve ICES into the Hamburg meeting on Biological data management (Chairs, E. Vanden Berghe)

Completed.

New actions for 2005/2006

Action 1: *Distribute the ICES User Survey among the MDM members (J. Gillin)*

Action 2: *Fill in the ICES survey to test it and report about it (All)*

Action 3: *Report the results of the discussion between WDC and ICES on how they could cooperate more effectively (J. Gillin, R. Gelfeld)*

Action 4: *Tidy up the Yahoo-group pages, and get the photos from there (G. Evans)*

Action 5: *Set up the local MDM pages at BODC Web pages (G. Evans, B. Gelfeld, M. Fichaut, S. Almeida)*

Action 6: *Synthesize the result of the list of CD-ROMs and products and put it on MDM website (G. Evans)*

Action 7: *Give comments on the MDM pages that will be set up at BODC (All)*

5.4 Theme session on data management at ASC 2006

Next year at the ICES Annual Science Conference, 19–23 September 2006 Maastricht, Netherlands, there will be a Theme Session on Data Management. All WGMDM members should consider the possibility to participate in this theme session and make some presentations on data management. A poster on MDM activities should be proposed to the Group by the chairs.

Report on 2004/2005 actions

Action 23: *Contribute to a theme session on Management of Integrated Data at the Annual Science Conference 2005 (all members)*

This theme session is reported to the Annual Science Conference of ICES in 2006, so the action has to be reported on next year.

New actions for 2005/2006

Action 8: *Circulate the information on the theme session on Data Management of the ASC in the WGMDM as soon as it will be available on ICES Web site (Chairs)*

Action 9: *Prepare contribution to the theme session on Data Management at the ASC in September 2006 (All)*

Action 10: *Prepare a new poster on MDM activities and submit it to the WGMDM (Chairs)*

6 TOR a – Quality assurance/control procedures

a) Identify and compare existing quality control and quality assurance procedures for physical, chemical and biological data in use at WGMDM member organizations, and recommend common standards and procedures to ICES and IOC/IODE.

The WGMDM guidelines have been developed over a number of years to provide consistent advice on how to provide data and accompanying information to data centres, to provide an overview of the quality control undertaken by data centres and to indicate the services data centres can provide to users. The guidelines are on the ICES website at: www.ices.dk/committe/occ/mdm/guidelines .

Last year a survey on existing practices on "Merging CTD and water sampler data" was initiated by T. de Bruin involving only a few members of WGMDM. It was then decided to send it

to the rest of the WGMDM members and to other ICES Working Groups (Working Group on Oceanic Hydrography (WGOH)) to cover more institutions in ICES countries.

Report on 2004/2005 actions:

Action 1: *Ensure all MDM members have links to the MDM guidelines (all)*
Not all members have links from their data centre web pages to the MDM guidelines web page, this action point should be maintained for next year.

Action 2: *Continue the promotion of the guidelines*

It was noted that several members have promoted MDM guidelines at many meetings or when they received visitors in their institutes. For next year, MDM members volunteer to check the guidelines and to update them if necessary. It will be very interesting for WGMDM that ICES report on the access to the guidelines from ICES website.

Action 3: *Request ICES to get links to the guidelines on other ICES web pages (i.e., Environment and fisheries) (Chairs)*

Little progress has been made, but the Environment links at ICES are in place. The website URL is http://www.ices.dk/env/guidelines/index.htm

The action point has to be maintained for next year to possible have more links to the guidelines.

Action 4: *Review the list of other guidelines sent by Taco de Bruin (Taco de Bruin as coordinator and all); send the list to Ocean Portal*

T. de Bruin introduced this agenda item. The number of items in the list of 'other guidelines' ('other' means in this case: 'not made by MDM') has increased tremendously since the WGMDM meeting in 2004. However, some of the original 'other guidelines' have vanished from the Internet. This clearly illustrates the need for a depository of guideline documents at the MDM or the ICES website. It was noted that the MDM Guidelines could not be found at the OceanPortal.

To raise the profile of the MDM guidelines, the MDM Guidelines poster should be downloadable in PDF format from the MDM website (complete with an abstract) so that MDM members can present this poster at meetings.

It was also noted that the ICES website has at least three pages with guidelines. This is very confusing for the user. MDM and ICES should endorse one guideline for every measurement type. The problem is how to identify the best guideline for measurement types for which MDM members have no specific expertise. It was suggested to collaborate with other groups, inside and outside ICES. For instance with the IODE-GEBICH group for biological and chemical data types, with HELCOM and OSPAR for monitoring data types, etc.

The MDM meeting decided to constantly update the list of 'other guidelines' and make this a continuous activity for which a Term of Reference is required.

The work of WGMDM was to identify guidelines. This has been done, and now there is a need to host this list somewhere on the ICES website. This could be a task for the data centre. In the mean time the list will be posted on the new MDM web page.

Action 5: Send the questionnaire about merging CTD and water samples to all MDM members (Taco de Bruin), MDM members have to fill it in and send it back to Taco de Bruin (all)

T. de Bruin gave a presentation on the preliminary results from the CTD questionnaire. Originally the questionnaire was sent to a selected number of MDM members. At the Brussels meeting in 2004 it was decided to make some changes to the questionnaire and to send it to all MDM members. The MDM members would then forward the questionnaire to all CTD operators in their countries. Since the revised questionnaire had not been sent to the MDM members until three weeks before the meeting in Sopot, it was decided to extend the period for returning the completed questionnaire till 1 September 2005.

The preliminary results show differences in CTD practice, which may be a problem if one wants to combine CTD/sample data from various sources. This is especially true if one wants to resolve small changes/effects in long-term trends, which is the case in many physical oceanographic experiments. There are two key problems. The first one is the way that CTD values are measured or calculated the moment the bottles are being closed. The second problem is whether the water in the bottle is the same as measured by the CTD at the moment of closure of the bottle. Both problems are addressed in the revised CTD questionnaire.

The MDM members are concerned that these differences in CTD practice may cause problems of which scientists may not be aware, but which are important when comparing or combining CTD values from various sources.

The outcome may be a MDM product (under the condition that it has impact and make differences) and it should be presented to ICES as a poster at the Annual Science Conference in 2006.

Action 6: Produce a summary of the results of the questionnaire (Taco de Bruin)

Action 7: Request comments from the Oceanic Hydrography WG on the summary of merging CTD and water sample (chairs)

These two actions have to be deferred to next year because they depend on the completion of the user survey that is currently going on.

New actions for 2005/2006

Action 11: Continue to promote the MDM guidelines and ensure all MDM members have links to the MDM guidelines (all)

Action 12: Revise the MDM guidelines: Moored ADCP (H. Sagen), Moored current meters (G. Slesser), Ship borne ADCP (M. Fichaut), Seasor (G. Dawson), Surface underway (M. Fichaut), Water Level (M.J Garcia), Xbt (G. Dawson), Net tow (G. Evans), Surface Drifting Buoy (S. Tomlinson), Profiling Float and Drifting Buoy (S. Tomlinson and M. Fichaut), when merging CTD and Discrete water sample guidelines one must take into account the results of the CTD questionnaire (L. Fyrberg, G. Dawson, T. de Bruin)

Action 13: Request ICES Secretariat and Working Groups to make links to the guidelines on other relevant ICES web pages (i.e. Fisheries, oceanography) (Chairs)

Action 14: Request ICES Secretariat to make available the list of identified guidelines provided by WGMDM (chairs)

Action 15: Monitor the Internet access to the guidelines at the ICES web site and report back (ICES)

Action 16: Update the poster on MDM guidelines for the Theme Session on Data Management of the ASC in 2006 and write an abstract for the guidelines poster (G. Evans, R. Gelfeld)

Action 17: Produce a summary of the results of the CTD questionnaire (T. De Bruin, M. Wichorowski)

Action 18: Produce a new poster presenting the results from the CTD questionnaire and present it on the ASC either 2006 or 2007 (T. de Bruin, M. Wichorowski)

Action 19: Request comments from the Oceanic Hydrography WG and the OCC (Oceanography Committee) on the summary of the CTD questionnaire on merging CTD and water sample (chairs)

Action 20: Request IODE-GE-BICH to cooperate on identifying guidelines on biodiversity (E. Vanden Berghe)

Action 21: Check that everything in the guidelines has a place in XML structure (E. Vanden Berghe, M. Wichorowski, R. Gelfeld)

Action 22: Develop an accurate list of best data collection guidelines building on the work of the 'other guidelines list' and the list of MDM guidelines and keep the list updated and available through internet access (T. de Bruin, E. Vanden Berghe, G. Evans)

Proposed rephrasing of the TOR

Quality assurance/control procedures - Identify and compare existing quality control and quality assurance procedures for integration of physical, chemical and biological data in use at WGMDM member organizations, and recommend common standards and procedures to ICES and IOC/IODE.

Proposed new TOR for next year

Data type guidelines - assess the continuous development and updating of an accurate list of best data collection guidelines and to recommend on encouraging the use of the guidelines by the scientific community.

7 TOR b – Taxonomy issues

b) Improve usefulness of the Integrated Taxonomic Information System (ITIS) to the marine community and actively promote ITIS within the ICES and IOC communities.

To introduce this term of reference, E. Vanden Berghe discussed the need of a register for taxonomic names, and the need of codes for the taxonomy. Then he presented the problems he sees with ITIS and the proposed solutions. ITIS, as a North American initiative, concentrates on North American biota; many of the names of European taxa are missing in their list. Having taxon names added to the ITIS list is slow; the speed with which non-North American names are added is hampering the use of ITIS as a reference list of names for other than North American data management. ITIS is aware of this problem, and a meeting is being planned to address the issues, and propose solutions.

One of the solutions could be for ITIS to accept lists from other organizations, after these organizations have been briefed on quality control procedures as applied by ITIS. One such list could be the North Atlantic Register of Marine Species (NARMS), which is being built as a combination of the European Register of Marine Species (ERMS) and the North West Atlantic Register of Marine Species (NWARMS). Together, these two lists cover the region of interest of ICES region. There are known gaps and weaknesses in the ERMS and NARMS databases: eg the unicellular organisms, which were not a part of the original ERMS proposal, and spe-

cific regions like the Baltic. These are being addressed, and should be resolved in a reasonable time frame.

A solution involving creation of 'temporary TSNs' (Taxonomic Serial Numbers) was discussed. This solution was considered to be difficult to administer, especially if the time lapse between creation and addition to ITIS is long. If a temporary list would be created, it would require close cooperation with ITIS. Also, M. Sorensen of the ICES Data Management team clarified that while ITIS is the official taxonomic list for reporting data to ICES, the TSNs are not essential for reporting biological community data to the ICES data system; using ITIS names must also be an option. In order to help reporting of data in the Baltic, the ICES Data Centre is currently conducting a free-format trial for zoobenthos data which allows the reporting of names which can not be found in ITIS as long as the source of the taxonomic name is submitted together with the data.

Report on 2004/2005 actions

Action 12: Compare records in ITIS with UNESCO Register of Marine Organisms (URMO); European Register of Marine Species (ERMS); Marine Species Database of Eastern Africa (MASDEA); other relevant databases; with a view to assess the number of records that would be available from other databases

Action 13: Monitor the completion of the matching of BODC's parameter dictionary to ITIS.

E. Vanden Berghe reported on the number of extra names that could be made available to ITIS.

- ERMS: 55,000 names, about half not in ITIS;
- MASDEA: 20,000 names, half not in ITIS;
- URMO;
- BODC parameter dictionary: 4548 names, 987 not in ITIS.

Proposed rephrasing of the TOR

Taxonomy issues - Improve usefulness of the Integrated Taxonomic Information System (ITIS) to the marine community and actively promote ITIS within the ICES and IOC communities.

8 TOR c – Operational Oceanography issues

c) Critically assess the data management practices in place in WGMDM member organizations in support of Operational Oceanography.

Report on 2004/2005 actions

Action 14: MDM members will submit links to web sites, where their institute/centre makes OO-data and products available, to Jan Szaron. He will then review the list and forward it to the "MDM web site review group" for inclusion (J. Szaron + all)

J. Szaron sent an email to all MDM members to ask them for a list of websites related to Operational Oceanography in their institute. Some of the members did not answer to J. Szaron email so the action has to be continued next year, with a deadline for submitting the list of websites to J. Szaron of 1 July 2005. J. Szaron presented a preliminary list of OO links and products. It was noted that ICES defines OO as hindcast, nowcast and forecast.

Action 15: MDM should examine OO in coastal areas (COOP) and ensure/propose that consistent standard sets of QC and processing procedures are used similar to those evolved and established for existing oceanic projects (OOPC) such as ARGO, SOOP etc. (L. Rickards)

Not much progress has been made on this action point, but further work will be done for next year with a focus on quality control procedures used upon such data.

New actions for 2005/2006:

Action 23: Continue to submit links to web site where member institutes makes OO data and products available and send it to J. Szaron before July 1st, 2005. He will review the list and send it to G. Evans for the MDM Web site (Members that didn't send their list, J. Szaron, G. Evans)

Action 24: Contact WGOH (Sheldon Bacon) to inform them on the list of OO that MDM is producing (Chairs)

Action 25: Investigate the QC procedures used in OO like in ARGO, COOP, GOSUD (L. Rickards, G. Evans, M. Fichaut, M. J. Garcia)

Proposed rephrasing of the TOR

Operational Oceanography issues - Critically assess the data management practices in place in WGMDM member organizations in support of Operational Oceanography.

9 TOR d – XML eXtended Markup Language

d) Evaluate and develop future directions for oceanographic data management based on the results from SGXML and make recommendations regarding adoption in the oceanographic community.

B. Gelfeld introduced this Term of Reference by giving a presentation on "Development of Marine Data Exchange systems using XML"This presentation was already given at the IODE XVIII meeting held in Oostende, Belgium 26–30 April, 2005.

The ICES/IOC Study Group on the Development of Marine Data Exchange Systems Using XML (SGXML) during its three-year existence concentrated its efforts on metadata standards, parameter dictionaries and generic data structures for use in an XML-based language because it soon appeared that XML is an excellent tool for metadata but not for data distribution. During the same three years the parallel EU project MarineXML undertook a review and analysis of the data exchange standards in the marine community to understand what standards were being used for data exchange and where they were being applied.

SGXML underlined that there is still a need for consolidation of metadata terminology. The standards need also to be extended explicitly for oceanography**.**

At the IODE XVIII meeting, it was decided that future XML work and development would continue. IODE XVIII Recommendation 7 recommends the establishment of a MarineXML Steering Group chaired by R. Lowry (BODC, UK.). The Groups terms of reference are to be:

(i) establish a Pilot Project to set up an ISO 19100 series of standards compliant standards register, with possible collaboration with IHO, to be hosted by the IODE Project Office;
(ii) monitor and assist with XML development activities in other IODE/JCOMM groups, such as ETDMP, GEBICH and SGMEDI.

WGMDM recommended that M. Wichorowski and the MDM Chairs participate at the first MarineXML Steering Group meeting and report back to MDM next year.

Report on 2004/2005 actions

Action 18: Circulate the report of the SGXML to all MDM Members (R. Gelfeld)

This has been completed. All MDM members have received a copy of the report.

Action 19: Check that everything in the guidelines has a place in XML structure (S. Scory, E. Vanden Berghe, M. Wichorowski)

This action has not progressed and should be reported on next year.

New actions for 2005/2006

Action 26: Report back to WGMDM the discussions of the IOC MarineXML Steering Group (M. Wichorowski, Chairs)

Action 27: Evaluate and document XML work at the national level as a mechanism for the efficient exchange of oceanographic data (All Members)

Proposed rephrasing of the TOR

Evaluate and develop future directions for oceanographic Marine Data Exchange Systems Using XML at the national and international level.

10 TOR e – Cooperation with ICES SGMID - BWGDDP

e) Comment on the report of the Study Group on the Management of Integrated Data (SGMID), and recommend strategies and solutions for data integration and distributed database systems at the ICES Secretariat.

G. Evans reported on the SGMID meeting on behalf of L. Rickards who attended the meeting. The draft report was made available to the WGMDM. SGMID was informed about the EU SeaDataNet proposal, NERC DataGrid, the Ocean Biodiversity Informatics conference and the AZTI ItxasGIS database. J. Gillin attended the meeting and presented ICES Secretariat developments including InterCatch, DOME and the Bureau Working Group on the Data Development Project. The two major areas of work and discussion were (1) the development of an updated ICES Data Policy and (2) technical solutions for integrated data systems including the use of GIS, quality flags and the importance of quality control, and the advantages and disadvantages of the use of codes/coding systems in databases.

In addition, SGMID discussed its future – as a Study Group has a limited lifetime of 3–4 years. It was agreed that the group would meet again – and a back to back meeting with WGMDM was suggested. SGMID discussed to change its parent committee (currently ACE) to the Consultative Committee or the Bureau, as this would better reflect the expected recipients of SGMID's report and recommendations. Possibly its name should also change to better reflect its remit. In addition the relationship with WGMDM needs to be clarified. A joint SGMID-WGMDM theme session "Environmental and Fisheries Data Management, Access, and Integration" is scheduled for the 2006 ASC.

The discussion on the 'Other Guidelines' resulted in a much more important discussion on the positioning of MDM within the ICES structure. According to ICES, the WGMDM "flies the flag for ICES in setting standards for global databases. It also provides an important interface for oceanographic and environmental data management in ICES, and promotes good data management practice." Yet, this role within the whole of ICES is not reflected in the positioning of MDM as a Working Group under the Oceanography Committee.

SGMID will cease to exist and is contemplating where to go within the ICES structure. If MDM were to move out of the 'parenthood' the Oceanography Committee, this might give the (incorrect) signal that the OCC will stop its activities. Besides, MDM also needs to continue to

report to OCC, in order to keep getting feedback from the physical oceanographers. Under the current ICES structure MDM needs to remain a Working Group under the Science Committees, to be allowed to select its own members.

The outcome of the discussions suggests to merge MDM with the SGMID into a new group of data managers, users and scientists called; WGIDM – the Working Group on ICES Data Management or WGIDIM – the Working Group on ICES Data and Information Management.

Suggested Terms of reference for the new group could be (where the four first ToRs might be part of the group's mission statement):

- to advise ICES on data management issues;
- to promote good data management practice within ICES;
- to give guidance to the ICES Data Centre;
- to liaise with relevant international data management bodies and programmes (IODE, GOOS, SeaSearch/SeaDataNet, etc.);
- plus some temporary ToRs from the current ToRs of MDM and SGMID.

Ideally to reflect its ICES-wide role, WGIDIM (we-gi-dim) should be a working group directly positioned under the Bureau, but it is essential that it reports to the Oceanography Committee, ACME, and ACE (and possibly also to ACFM) and not to the Bureau, because WGIDIM definitely needs feedback from the Science and Advisory committees. The group should remain being a Working Group. Members were concerned about the number of persons participating in this new WG as a merger will result in a "big" working group with all the associated disadvantages.

The Bureau Working Group for Data Development Project (BWGDDP) who report to the ICES Bureau requested MDM to:

- Optimise quality control by providing instructions, training and assistance to institutes that do not conform to WGMDM guidelines,
- Advice on processing and prioritisation of ICES-Data Centre's activities on oceanographic data.

Concerning the first point the WGMDM decided that H. Sagen who was invited to the BWGDDP on 12 May 2005, would try to clarify what exactly the BWGDDP means by "training" institutes.

On the second point, H. Sagen asked the members of MDM of their opinion on the necessity of ICES to continue the quality control on data that have already been quality checked by its owner. ICES could load these data without any QC or with a reduced set of QC. Some WG members thought that having a second opinion on a data set's quality is important.

There was a discussion on which data ICES should concentrate its effort on, and what are the priorities for the data? Obviously, the answer will come out of the result of the User Survey.

Report on 2004/2005 actions

Action 20: Continue dialogue with SG-MID especially on future collaboration (L. Rickards, Chairs)

A short informal meeting between the chairs of WGMDM, SGMID, the ACE Chair and the ICES Data Centre Manager took place during the ICES ASC 2004. The two groups agreed to work together on the coming theme session at the Annual Science Conference in 2006 and possibly meet back to back. The chairs also meet during the work of BWGDDP.

Action 21: Provide comments on SG-MID report (all)

The SGMID report was distributed at the WGMDM meeting. Members were encouraged to read the report.

Action 22: Attend SGMID meeting in 2005 (L. Rickards)

L. Rickards attended the meeting in April.

New actions for 2005/2006

Action 28: Contact SGMID for back to back meeting next year - or contact them for possible merge WGMDM and SGMID

Proposed new TOR for next year

Future structure – Merge WGMDM with SGMID into a new group of data managers, users and scientists called the Working Group on ICES Data and Information Management. The mission of the new group will be to:

- to advise ICES on data management issues;
- to promote good data management practice within ICES;
- to give guidance to the ICES Data Centre;
- to liaise with relevant international data management bodies and programmes (IODE, GOOS, SeaSearch/SeaDataNet, etc.).

The Terms of Reference for the group are a mixture of WGMDM and SGMID ToRs. The Working Group on ICES Data and Information Management will be positioned directly under the ICES Bureau, but will report to the Science Programme through Oceanography Committee and to three advisory Committees (ACE, ACME, ACFM) and the Annual Science Conference or in-between, whenever appropriate.

11 TOR f – GIS Geographical Information Systems

f) Critically examine the use of GIS in marine data systems in WGMDM member countries, and make recommendations as to the use of GIS

Janus Larsen, ICES Data Centre, has asked WGMDM about our use of GIS. H. Sagen introduced the discussion about this Term of Reference by presenting the GIS tools tested at IMR, Norway.

At IMR the main GIS system is ESRI ArcGIS 9.x. The product ArcIMS is used for Internet presentations. To establish dynamically maps, public domain tools have been used. ArcIMS is used for presentation only.

Examples of developed Internet tools are the user interface to a netCDF formatted temperature atlas in the Barents Sea or fish distribution maps for different species in the Barents Sea. Seasonal maps are available as different layers and can be switched on and off according to user interactions.

Many other MDM members also use ArcIMS for the Web. S. Jans (Belgium) demonstrated the Web site with on line data access using ArcIMS Spatial Tool Viewer, M. Wichorowski (Poland) also demonstrated a Web site on WebGIS of the Puck Lagoon and WebGIS of Svalbard, both of them using ArcIMS Web service, M. Fichaut (France) said that in her institute two types of GIS are used (ESRI products : ARCIMS for the Web, and ARCView for workstations and also MAPSERVER for the Web).

The conclusion of the discussion was that there are multiple benefits using GIS and MDM recommends it, but MDM have to investigate on open software such as MAPSERVER and

have to look into existing standards before making any further specific recommendations. However, MDM can already recommend the use of standards such as ISO-19115 for the Metadata and OPENGIS for the diffusion of geographic objects (WMS = Web Map Service, WFS = Web Feature Service).

New actions for 2005/2006:

Action 29: Investigate the use of Open source GIS as compared to commercial ones (ESRI) (S. Jans, M. Wichorowski, M. Fichaut, H. Sagen, E. Vanden Berghe)

Proposed rephrasing of the TOR

GIS Geographical Information Systems - Critically examine the use of GIS in marine data systems in WGMDM member countries, especially to investigate the use of Open Source GIS as compared to commercial ones like ESRI.

12 Report on other 2004/2005 actions

Report on 2004/2005 actions

Action 16: Contribution of the members to GOSUD (L. Rickards)

No progress has been made on data delivery to GOSUD but contact has been taken between Sweden, Norway and the GOSUD project. Sweden planned to deliver underway thermosalinograph data from R/V Argos before the end of 2005. Norway has similar plans.

Action 17: Ask the MDM members to give a list of their CD-ROMs and Products, send the complete list to IOC/IODE (G. Evans, L. Rickards)

G. Evans reported that she had received a list from several members, but not made any synthetic list yet. She will continue the work and compile the list before next years meeting. Members that still not have sent their contribution are encouraged to contribute. Action point is continued under number 6 for next year.

Action 25: Provide information to J. Gagnon to see if he can input data from the Western North Atlantic in EDIOS (L. Fyrberg, P. Alenius, S. Sagan, R. Gelfeld)

L. Fyrberg reported that she has been in contact with J. Gagnon, who was not willing to submit entries to EuroGOOS/EDIOS, but suggested a link to the Global Change Master Directory (GCMD), ”which provides a more global meta-data inventory of datasets when looking outside your more regional EDIOS European marine focus”. In his opinion the EDIOS marine community in particular “might benefit from searching the GCMD meta-data http://gcmd.nasa.gov/Data/portals/gcmd/param_search/OCEANS.html in particular."

He also suggested that the current 8,500 data entries should be represented in the GCMD if they are not already. J. Gagnon set L. Fyrberg in contact with GCMD, who answered that they (had a new science coordinator and) were working on a map server and plan to offer several MODIS products (including SST) through their new prototype.

L. Fyrberg sent the suggestion to Hans Dahlin, Director of EuroGOOS, who answered that he wanted to keep down the amount of links from EDIOS website, but welcomed links to EDIOS.

T. de Bruin suggested to investigate the possibility of distributed searching in several databases or harvesting the relevant contents from the GCMD database and incorporate this into the EDIOS database. Harvesting: (New) Contents, corresponding to certain keywords or search criteria is copied from one database and incorporated into another database. Distributed

searching: A query is directed to several databases, mapping the relevant keywords on the fly and returning the results from all the databases into one combined answer.

Action point is considered fulfilled without success and is terminated.

Action 26: Send current meters inventory to BODC (H. Sagen, H. Parner, S. Jans, T. de Bruin, E. Vanden Berghe)

Nobody has sent their inventory to BODC, action point to be continued next year.

New actions for 2005/2006

Action 30: Report on WGMDM member contribution of underway data to the GOSUD project (All)

Action 31: Overview of ongoing projects in which MDM members could participate as GOSUD, ARGO (T. De Bruin)

Action 32: Check if EUROGOOS and ICES have some agreement on EDIOS (M. Fichaut)

Action 33: Send current meters inventory to BODC (H. Sagen, H. Parner, S. Jans, T. de Bruin, E. Vanden Berghe)

Action 34: Send IBTS data as soon as possible to ICES to support NORSEPP program (H. Sagen, J. Szaron, M. Fichaut, A. Joyce, T. de Bruin)

13 Proposed Terms of Reference for 2006

a) Quality assurance/control procedures - Identify and compare existing quality control and quality assurance procedures for integration of physical, chemical and biological data in use at WGMDM member organizations, and recommend common standards and procedures to ICES and IOC/IODE.

b) Data type guidelines - assess the continuous development and updating of an accurate list of best data collection guidelines and to recommend on encouraging the use of the guidelines by the scientific community.

c) Taxonomy issues - Improve usefulness of the Integrated Taxonomic Information System (ITIS) to the marine community and actively promote ITIS within the ICES and IOC communities.

d) Operational Oceanography issues - Critically assess the data management practices in place in WGMDM member organisations in support of Operational Oceanography.

e) XML – extended Markup Language - Evaluate and develop future directions for oceanographic Marine Data Exchange Systems using XML at the national and international level.

f) GIS Geographical Information Systems - Critically examine the use of GIS in marine data systems in WGMDM member countries, especially to investigate the use of Open Source GIS as compared to commercial ones like ESRI.

g) Future structure – Merge the WGMDM with the SGMID into a new group of data managers, users and scientists called the Working Group on ICES Data and Information Management. The mission of the new group will be to:

- to advise ICES on data management issues
- to promote good data management practice within ICES
- to give guidance to the ICES Data Centre

- to liaise with relevant international data management bodies and programmes (IODE, GOOS, SeaSearch/SeaDataNet, etc.)

The Terms of Reference for the group are a mixture of WGMDM and SGMID ToRs. The Working Group on ICES Data and Information Management will be positioned directly under the ICES Bureau, but will report to the Science Programme through Oceanography Committee and to three advisory Committees (ACE, ACME, ACFM) and the Annual Science Conference or in-between whenever appropriate.

14 Any other business

Nothing was discussed during the meeting.

The German representative was excused from the meeting and this meant that there was no discussion on Cruise Summary Reports, CSR/ROSCOP. The Co-Chairs felt that this was an important issue. Discussions took place at the IMDIS conference, which was held from 31 May–3 June 2005 in Brest, between the Co-Chairs and F. Nast. The following paragraph describes the outcome of the discussions:

ROSCOP/CSR's have been managed by the ICES Secretariat since the late 1960s. However there was a decline of submissions in the 1990s pointed out by the ICES representatives during MDM meetings. CSR's were heavily used in Germany as part of their data tracking system. Therefore Germany was asked to develop a system that could be of use for other countries in the Sea Search network (i.e., pan-European). With help from the EC they developed an online entry-/retrieval tool compatible with the paper forms for ROSCOP/CSR's. The system has been used within the last two years by countries that had not submitted CSR's before as well as by those countries that faced a decline in submissions. More than 1200 forms have been submitted to ICES through this system.

MDM recommends the continuation of this system and emphasizes that discussions and tuning are required between BSH/DOD and ICES to prevent a misunderstanding at national data centres in Europe concerning optimisation and harmonisation of ROSCOP/CSR databases. Both databases should be of equal content. ICES is a principal partner in the EU 6th Frame Work proposal SeaDataNet, and has agreed on the mirroring and constructive collaboration of the ROSCOP/CSR databases. The item should be kept under discussion at the next MDM meeting.

15 Concluding remarks

The WGMDM members were very pleased to have participation from the ICES Data Centre due to the important cooperation between the data managers and the data centre.

The ICES Data Centre presentation of the new organisation in the ICES Secretariat was of great interest for the WGMDM members.

The WGMDM chairs are concerned about the fact that the meeting agenda was very tight for a three-day meeting. The national presentations were interesting, but too time-consuming. The chairs suggest that next year's meeting should include only one presentation on each TOR made by a volunteers among the members.

The WGMDM members are all concerned about the future of the Working Group. Several members expressed that the work of data management must be carried on in ICES.

16 Next meeting

The WGMDM chairs accepted the kind offer from M. Garcia on behalf of Spain to host the next meeting in Madrid from 8–10 May 2006.

The WGMDM Co-Chair closed the meeting by thanking the participants for their contribution. On behalf of the WGMDM, the chairs also thanked the IOPAS for their warm hospitality and arrangements and in particular acknowledged the efforts of M. Wichorowski, S. Sagan and their colleagues from the institute.

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Annex 2: Detailed meeting agenda

Monday 9 May – Rapporteur **Bob Gelfeld**

0900-1000	Opening greetings by	*[Chairs]*
	Welcome by Director of Institute, Prof. Stanislaw Massel	
	Local arrangements by IOPAS	***[Marcin Wichorowski]***
	Review meeting schedule and items for discussion	***[Chairs]***
	Review action items from last year's meeting	***[Chairs]***
1000-1100	National presentations (1)	***[Helge Sagen]***
1100-1130	Coffee break	
1130-1230	**TOR A)** Action point 1 to 4	
	Status WGMDM guidelines	***[Helge Sagen]***
	Action point 5 to 7	
	Questionnaire about merging CTD and water sample data	*[Tacode Bruin]*
1230-1345	Lunch	
1345-1415	Atlas of Southern Ocean Planktonic Ostracods	***[Kasia Blachowiak-Samolyk]***
1415-1530	National presentations (2)	***[Michèle Fichaut]***
1530-1600	Coffee break	
1600-1700	**TOR B)** Action point 12 and 13	
	Compare ITIS, RMO ERMS, MSDEA and others	***[Edward vanden Berghe]***
	Matching BODC parameter dictionary to ITIS	***[Gaynor Evans]***
1700-1800	User survey on ICES data centre products and services	***[Julie Gillin]***
2000	Social event (dinner)	

Tuesday 10 May – Rapporteur **Taco de Bruin**

0900-1000	National presentations (3)	***[Helge Sagen]***
1000-1100	**TOR C)** Action point 14 and 15	
	Best practice for Data Man. in Operational oceanography	***[Jan Szaron]***
	Metadata – QC issues – products	
	Operational Oceanography in coastal areas (COOP)	***[Gaynor Evans]***
1100-1130	Coffee break	
1130-1230	Action point 8 to 11 and 23 to 24	***[Chairs ++]***
	ICES future data management strategy and plans	***[Julie Gilllin]***
	Theme session, Management of Integrated data	***[Helge Sagen ++]***
	at ASC 2006 MDM web pages at ICES website	
1230-1345	Lunch	
1345-1500	**TOR D)** Action point 18 and 19	***[Bob Gelfeld]***
	Efforts from SGXML, directions for ocean data management	
	Possible new data exchange procedures	
1500-1530	Coffee break	
1530-1700	ICES data policy – presentation of draft, national data policies, discussion	***[Julie Gillin]***

Wednesday 11 May – Rapporteur **Lotta Fyrberg**

0900-1000	National presentations (4)	***[Michele Fichaut]***
1000-1100	**TOR E)** Action point 20 to 22	
	Update on SGMID activities Study Group on the	***[Gaynor Evans]***
	Management of Integrated Data, and comment on their report	
	The Bureau Working Group Data development Project	***[Helge Sagen]***
	recommendations to MDM	
1100-1130	Coffee break	
1130-1230	Action point 16, 17 and 25, 26	***[Gaynor Evans]***
	Inventories: Current meters inventory, EDIOS	
	Contribution of underway data to GOSUD	
	Member products list (CDROMs etc)	
1230-1345	Lunch	
1345-1500	TOR F) Marine GIS, potential benefits, recommendations	***[Helge Sagen ++]***
	made on best practice and use of GIS	
1500-1600	Other business – conclusions – next meeting	

Annex 3: WGMDM TOR 2004/2005

The **Working Group on Marine Data Management** [WGMDM] (Co-Chairs: Michele Fichaut, France and Helge Sagen, Norway) will meet in Sopot, Poland from 9–11 May 2005 to:

a) Identify and compare existing quality control and quality assurance procedures for physical, chemical and biological data in use at WGMDM member organizations, and recommend common standards and procedures to ICES and IOC/IODE.

b) Improve usefulness of the Integrated Taxonomic Information System (ITIS) to the marine community and actively promote ITIS within the ICES and IOC community.

c) Critically assess the data management practices in place in WGMDM member organisations in support of Operational Oceanography.

d) Based on the final report and results of the SGXML, make recommendations regarding adoption of the use of XML in the oceanographic community.

e) Comment on the report of the Study Group on the Management of Integrated Data (SGMID), and recommend strategies and solutions for data integration and distributed database systems at the ICES Secretariat.

f) Critically examine the use of GIS in marine data systems in WGMDM member countries, and make recommendations as to the of GIS

Supporting Information

Priority:	This Group flies the flag for ICES in setting standards for global databases. It also provides an important interface for oceanographic and environmental data management in ICES, and promotes good data management practice.
Scientific Justification:	a) Action Plan 4.12, 6.1 b) Action Plan 6.4 c) Action Plan 5.13.4 d) Action Plan 5.13.4, 6.1 e) Action Plan 6.1 f) Action Plan 6.1, 6.2 a) This will encourage standardization of approach in management and quality control across a broad spectrum of data types and to promote best practice in data management. It will include promoting and developing the WGMDM guidelines and also development of recommended practices for merging CTD and water bottle data. b) The ITIS can play a major role in standardization and improving the ease of data exchange. It is an evolving partnership which requires input from (new) collaborators whilst maintaining community standards. In particular, this will seek to improve coverage of non-North American marine species, encourage the development of remote data entry and implementation of a mirror site. The ITIS should be actively promoted with the communities and groups encouraged feed in their information. c) As GOOS activities develop it is essential that the modern marine data management systems are in place and utilized effectively. This will serve to assess established systems and recommend best practice for data management for operational oceanography. This item will examine various issues including metadata directories, developments for quality control, referral mechanisms, products (climatologies), data stewardship, etc. d) The data management community must evaluate the use of new technologies, such as XML, in a broader context. The WGMDM will attempt to integrate the efforts of SGXML into this broader context and develop possible directions for ocean data management in a distributed environment. The efforts of SGXML have potential implications and application to general data exchange procedures. These efforts should be followed within the broader context of general oceanographic data flow.

	e) Establishing data integration is a step in developing the scientific basis for an ecosystem based approach to management. This is of high priority to ICES. Good data management practice is required to ensure the underpinning databases are as complete and as high quality as possible. Data management expertise from WGMDM will complement user requirements from SGMID. f) The use of GIS is becoming increasingly important for the marine community. The potential benefits (and problems) of this technology will be examined and recommendations made on best practice and use of GIS.
Resource Requirements:	None
Participants:	Core Group of members of national oceanographic data centres ensure well attended meetings.
Secretariat Facilities:	None, apart from preparation of material by the Data Centre Manager or Science Network Coordinator
Financial:	The Data Centre Manager or Science Network Coordinator should attend this meeting
Linkages To Advisory Committees:	Report is seen by ACME
Linkages To other Committees or Groups:	None, but links should be encouraged to broaden the scope of the group to more generic data management issues
Linkages to other Organisations	IOC, especially its Working Committee on International Oceanographic Data and Information Exchange (IODE)

Annex 4: WGMDM action list 2004/2005

No.	Action item	Who
1	Ensure all MDM members have links to the MDM guidelines	All members
2	Continue the promotion of the guidelines	All members
3	Request ICES to get links to the guidelines on other ICES Web pages (i.e. Environment and fisheries) (Chairs)	Chairs
4	Review the list of other guidelines sent by Taco de Bruin (Taco de Bruin as coordinator and all); send the list to Ocean Portal	T. de Bruin
5	Send the questionnaire about merging CTD and water samples to all MDM members (Taco de Bruin), MDM members have to fill it in and send it back to Taco de Bruin (all)	T. de Bruin + all members
6	Produce a summary of the results of the questionnaire	T. de Bruin
7	Request comments from the Oceanic Hydrography WG on the summary of merging CTD and water sample (Chairs)	Chairs
8	Request the ICES secretariat to provide and update on their future data management strategy and plans	Chairs
9	Request the ICES secretariat sends a representative (e.g., Data Centre Manager) to the next MDM meeting	Chairs
10	Request IODE project officer to attend the next MDM meeting	L. Rickards
11	Send information to the ICES Secretariat of what MDM would like to see on the MDM web pages	H. Parner, R. Gelfeld, G. Evans
12	Compare records in ITIS with UNESCO Register of Marine Organisms; European register of Marine Species; Marine Species Database of Eastern Africa; other relevant databases; with a view to assess the number of records that would be available from other databases	E. Vanden Berghe, T. O'Brien, S. Sagan, J. Szaron
13	Monitor the completion of the matching of BODC's parameter dictionary to ITIS	E. Vanden Berghe, G. Evans
14	MDM members will submit links to web sites, where their institute/centre makes OO-data and products available, to Jan Szaron. He will then review the list and forward it to the "MDM web site review group" for inclusion	All members + Jan Szaron
15	MDM should examine OO in coastal areas (COOP) and ensure/propose that consistent standard sets of QC and processing procedures are used similar to those evolved and established for existing oceanic projects (OOPC) such as ARGO, SOOP etc.	L. Rickards
16	Contribution of the members to GOSUD	L. Rickards
17	Ask the MDM members to give a list of their CD-ROMs and Products, send the complete list to IOC/IODE	G. Evans, L. Rickards
18	Circulate the report of the SGXML to all MDM Members	R. Gelfeld
19	Check that everything in the guidelines has a place in XML structure	S. Scory, E. Vanden Berghe, M. Wichorowski
20	Continue dialogue with SGMID especially on future collaboration	L. Rickards, Chairs
21	Provide comments on SGMID report	All members
22	Attend SGMID meeting in 2005	To be decided
23	Contribute to a Theme Session on Management of Integrated Data at the Annual Science Conference 2005	All members for posters
24	Try to involve ICES into the Hamburg meeting on Biological data management	L.Rickards, E. Vanden Berghe
25	Provide information to J. Gagnon to see if he can input data from the Western North Atlantic in EDIOS	L. Fyrberg, P. Alenius, S. Sagan, R. Gelfeld
26	Send current meters inventory to BODC	H. Sagen, H. Parner, S. Jans, T. de Bruin, E. Vanden Berghe

Annex 5: List of acronyms and terms

Acronym or Term	Description
ACE	Advisory Committee on Ecosystems
ADCP	Acoustic Doppler Current Profiler
ARGO	The Array for Real-time Geostrophic Oceanography (profiling floats)
ASC	Annual Science Conference organised by ICES
BMDC	Belgian Marine Data Centre
BODC	British Oceanographic Data Centre
BSH	Bundesamt für Seeschifffahrt und Hydrography (Germany)
BWGDDP	Bureau Working Group for Data Development Project
CD-ROM	Compact Disk – Read Only Memory
CEFAS	Centre for Environment Fisheries and Aquaculture Science
COOP	Coastal Ocean Observations Panel (GOOS)
CSR	Cruise Summary Report (formerly known as ROSCOP)
CTD	Conductivity-Temperature-Depth
DOD	Deutche Oceanographice Dataen zentrum
DOME	Database on Oceanography and Marine Ecosystems (Integrated ICES database)
EDIOS	European Directory of the Initial Ocean-observing System
EDMED	European Directory of Marine Environmental Data
ETDMP	JCOMM-IODE Expert Team on Data Management Practices
ERMS	European Register of Marine Species
ESRI	Environmental Systems Research Institute
EU	European Union
EUROGOOS	European Global Ocean Observing System
FIMR	Finnish Institute of Marine Research
FRS	Fisheries Research Services
GBIF	Global Biodiversity Information Facility
GE-BICH	IOC's Group of Experts on Biological and Chemical Data Management and Exchange Practices
GIS	Geographic Information System
GCMD	Global Change Master Directory (from NASA)
GOOS	Global Ocean Observing System
GOSUD	Global Ocean Surface Underway Data
IBTS	International Bottom Trawl Survey
ICES	International Council for the Exploration of the Sea
IEO	Instituto Español de Oceanografía
IMR	Institute of Marine Research (Norway)
IOC	Intergovernmental Oceanographic Commission
IODE	International Oceanographic Data and Information Exchange
IOPAS	Institute of Oceanology Polish Academy of Sciences
ISO	International Standards Organisation
ITIS	Integrated Taxonomic Information System
JCOMM	IOC-WMO Joint Technical Commission on Oceanography and Marine Meteorology
MASDEA	MArine Species Database of Eastern Africa
MDIP	Marine Data and Information Partnership (UK)
MODIS	MODerate resolution Imaging Spectroradiometer
MUMM	Management Unit of Mathematical Modelling for the North Sea
NARMS	North Atlantic Register of Marine Species

NERC	Natural Environment Research Council
NODC	U.S. National Oceanographic Data Center
NWARMS	North West Atlantic Register of Marine Species
OBIS	Ocean Biogeographic Information System
OO	Operational Oceanography
OOPC	Ocean Observations Panel for Climate (GOOS)
QC	Quality Control
ROSCOP	Report of Observations/Samples Collected by Oceanographic Programmes (now CSR)
SGMEDI	Study Group on the Marine Environmental Data Inventory
SGMID	ICES Study Group on the Management of Integrated Data
SGXML	ICES/IOC Study Group on the Development of Marine Data Exchange Systems using XML
SISMER	French National Oceanographic Data Centre
SMHI	Swedish Meteorological and Hydrological Institute
SOOP	Ship of Opportunity Programme
SQL	Structured Query Language
SST	Sea Surface Temperature
TSN	Taxonomic Serial Number
UKHO	UK Hydrographic Office
UNESCO	United Nations Educational, Scientific and Cultural Organisation
URMO	UNESCO Register of Marine Organisms
VLIZ	Flanders Marine Institute
WDC	World Data Centre
WGMDM	Working Group on Marine Data Management
WGOH	Working group on Oceanic Hydrography
WMO	World Meteorological Organisation
XBT	Expendable Bathythermograph
XML	Extensible Markup Language

Annex 6: Summary of the national presentations

Report on FIMR activities

Pekka Alenius – Finnish Institute of Marine Research (FIMR), Finland

The process in renewing the database systems at FIMR has proceeded with small but important steps:

- MySQL was chosen to be the database server at this stage;
- A CTD-database and query software for the database has been developed;
- A sea level database has been developed with a special query software including tools for doing sea level forecasts. This system has been in operational use since mid-January 2005 after an extremely high water level incident in the Gulf of Finland on 9 January 2005.
- Shipborne nutrient and biological data has been put into a preliminary MySQL database but the process of further developing the data model is underway
- A new data model for the AgaLine (http://www.fimr.fi/en/itamerikanta/levatiedotus.html) system has been developed and the implementation is underway. This is a project where almost real time data for monitoring algal blooms is collected in co-operation by FIMR, several regional environment centres, city of Helsinki and Estonian Marine Institute and Estonian Maritime Academy from Estonia.
- Computer-aided cruise planning software has been extended to include a semi-automatic cruise report generator and simple data analysis possibilities.

Slides are at the end of this annex.

Operational Oceanography in the Portuguese Hydrographic Office

Sara ALMEIDA – Instituto Hidrografico, Portugal

This is a short presentation on our new products and short-term plans.

As from February 2005, the Portuguese Hydrographic Institute has made available on the web, daily wave forecasts, within the aim of the MOCASSIM (OCeanographic Models with data ASSIMilation) project.

There are two domains: one global, for the North Atlantic Basin and a regional one, for the Continental Portuguese coast. We make available nowcasts and forecasts for six and three days, respectively. From the Portuguese Hydrographic Institute network of wave riders, we use the data for the assimilation models and to test the performance of these models.

Netherlands National Oceanographic Data Committee activities

Taco de BRUIN – Royal Netherlands Institute for Sea Research (Royal NIOZ), Netherlands

NODC*i*: A National Infrastructure for access to oceanographic and marine data and information

The Netherlands National Oceanographic Data Committee (NL-NODC) represents eight institutions from the governmental, scientific, and private sectors. These are the Institute for Coastal Research and Management (RIKZ), the Royal Netherlands Institute for Sea Research (NIOZ), the Hydrographic Office of the Royal NL Navy (HYD), the Royal Netherlands Meteorological Office (KNMI), the Netherlands Institute for Applied Geosciences (NITG), the Center for Estuarine and Marine Ecology (CEME), the Directorate North Sea (DNZ), and Delft Hydraulics (WL). Marine Information Service (MARIS) is the NODC advisor.

These eight institutes handle a large variety of data ranging from biological, chemical, and physical oceanography data to geological, model and marine meteorology data. Most of the data are collected in the Dutch part of the North Sea, but some institutes operate worldwide.

In the past the NL-NODC has put the organizational structure to exchange data in place. All NODC partners have signed an agreement to exchange data and the NODC has developed a national oceanographic data policy. But so far, the technical infrastructure for data exchange was lacking. All partners are using different database systems and different formats. Some databases are online, whereas others are not.

To overcome these technical difficulties, the NODC has started the NODC*i* project, to build a National Infrastructure for Access to Oceanographic and Marine Data and Information.

The NODC got a grant of 0.5 million Euro from the Dutch BSIK programme Space for Geo-Information.

The project has started in February 2005 and will end in December 2007.

The goals of the NODC*i* project are:

- to built a central index of all data in the partner databases;
- to allow the user transparent access via Internet to the partner databases (fully distributed system);
- to harmonize quality, formats, accessibility and exchange of data by NODC*i* partners and third parties, using (inter)national standards.

Bathymetric survey results from the epicentre of the Indonesian earthquake of 26 December 2004 / UK Marine Data and Information Partnership

Garry Dawson – Hydrographic Office, United Kingdom

The presentation consisted of two, quite different, parts.

Firstly, images of the seabed in the vicinity of the epicentre of last year's Indonesian earthquake, created from high resolution swath bathymetric data were presented. The data, collected in early February 2005 by Royal Navy survey vessel HMS SCOTT will be used to identify evidence of relatively (in geological terms) recent seabed movement (slumps, slides, faults, and folds) as targets for future study and provide baseline data for further studies using other types of equipment.. Due to the absence of earlier data, it is probably not possible to identify movements that occurred during the recent earthquake.

Secondly the work towards establishing a UK Marine Data and Information Partnership (MDIP) was described. MDIP is intended to improve access and to enable improved stewardship of the marine environmental data within the UK. The partnership is supported by a wide range of UK public sector agencies. It is anticipat ed that the outcome will be a step towards a distributed system data within the UK.

Assembly of the Marine Productivity dataset at BODC

Gaynor EVANS, Gwen Moncoiffé and Malcolm Hearn – British Oceanographic Data Center (BODC), United Kingdom

The British Oceanographic Data Centre (BODC) is responsible for the management and long-term curation of digital information and data arising from a thematic programme called Marine Productivity (MarProd). This is a five-year research programme funded by the Natural Environment Research Council (NERC) in the UK. From the outset of the programme, BODC has worked closely with the MarProd scientific community to ensure that data collected as part of the programme are assembled in a high quality, easily accessible dataset with quality controlled, fully integrated and documented data.

The data management project is now reaching its final stages and effort is currently being divided between acquiring the last outstanding data sets, and reformatting and banking data that have already been received. As of the beginning of March 2005, about a third of all 198 iden-

tified data sets were still outstanding. All data sets will be finally transferred from BODC's Oracle database into an Access database and published on CD-ROM at the end of 2005.

IFREMER new developments for data management

Michèle Fichaut – Institut Français de Recherche pour d'Exploitation de la Mer (IFREMER), France.

NAUTILUS, the IFREMER/SISMER web portal has opened on the Internet. This web portal has been designed to facilitate access to data, so that the end user can access sea cruise reports (ROSCOP), data set inventory (EDMED), and data held in IFREMER through a unique web interface. This portal has been based on an interoperability schema with geographical and earth observation standards (ISO, OpenGIS), and new information technology (web services, …). It is able to retrieve data from several databases:

- French sea cruises;
- Some of European cruises (MATER,MEDATLAS…);
- Automatic equipments (Argo floats, …).The architecture of the web portal is based on two layers:

- The connector's layer which provides a normalised interface to query different databases. One connector must be written per database.
- The user interface layer: the web portal layer which allows the user to write his request and dispatch it to all the relevant connectors.

The normalization between the two layers is based on ISO-19115 (metadata and user queries) and OPEN GIS.

Connectors are implemented as web services activated by the SOAP protocol.

The information displayed to the user are received from the connectors in XML and translated in HTML through a set of style-sheets.

In the beginning of 2005 IFREMER started a new **program on Coastal Operational Oceanography** in cooperation with several institutes in France. This program aims to provide information on the marine environment of the French coastal area at different time scales (short-term forecast, nowcast and hindcast), and different spatial: Oceanic basin to a bay. The end-users of this system will be:

- Professional users: shell-fish breeders, fishermen, maritime transport, offshore industry;
- Managers of the coastal ocean administrations;
- Scientific users: national and European co-operation;
- Engineering and design departments in environment (impact studies);
- General users (swimming, diving, water sports).

In the frame of this program SISMER has to develop the data centre for these Coastal Operational Oceanographic data, whose role it will be to:

- Collect the data :
  - Reference data (bathymetry, coastlines, seafloor type);
  - Boundary and initial conditions data (wind, swell, river flow, climatology…);
  - *In situ* data (XBT, CTD, ADCP, Sea level, Current meters, bottle data, …);
  - Spatial data (Wind, SST, Ocean colour);
- Quality check and Archive the data;
- Deliver the data to the modellers;
- Distribute the results and the products (models/data).

Oceanographic mooring Måseskär W - - part of the EU-funded project Forum Skagerrak II Interreg IIIB North Sea.

Lotta FYRBERG – Swedish Meteorological and Hydrological Institute (SMHI), Sweden

The Skagerrak is an area influenced by water from the Baltic and the North Sea. Harmful algal blooms (HABs) are a major concern in the area for aquaculture and the whole marine ecosystem. The water is mostly stratified and HABs sometimes occur in thin layers in the water column. To monitor the development and advection of blooms higher temporal resolution than regular ship monitoring is necessary. Satellites only ”see” the uppermost part of the sea and FerryBox systems also only sample the upper 3-4 meters. A mooring with a profiling multiparameter device is deployed at ca 50 m depth close to the Swedish coast

The aim of the system is to provide high quality real time data for assessment of the environmental state, warnings of HABs and data assimilations into models. The platform will be part of a network for early warnings of harmful algal blooms etc.

Limitations

Only high biomass blooms are monitored using automatic techniques. Low biomass species causing, e.g., shellfish poisoning still require frequent sampling and microscopy.

Tools for analysis and Internet access to oceanographic data developed at IEO

Maria-Jesus GARCIA – Instituto español de Oceanografia (IEO), Spain

Oceanographic data presented originally in ASCII format (MEDATLAS) is being organizing in an open source MySQL database. The software to managing and analyzed oceanographic data actually consists of two more components SELAVI and INDAMAR apart from the QCDAMAR.

- **SelAVi**: Selection, Analysis and Visualization. A set of utilities working with oceanographic data presented in the form of MySQL database. Includes input data script, powerful space/time/content selection queries with statistical climatic values calculation, plotting of original and mean profiles together with vertical interpolation, horizontal mesh construction (using Delaunay triangulation) and isolines visualization.

  Programming languages: C++, PHP; operating system – Windows.
- **InDaMar**: Marine Data Information in Internet. Tools for accessing a subset of the whole oceanographic database from the Internet. At this moment includes similar to SelAVi interface forms necessary to construct complex data selection query and the possibility to download its results.

- Programming languages: PHP; operating system – Linux, Windows.

All three components mentioned above are functional and are under permanent testing and development. Current works are focused in improving database structure and import scripts and in implementing friendly user interface to access and retrieve the data from Internet.

Global Argo Data Repository (GADR)

Bob Gelfeld, Charles Sun – U.S National Oceanographic Data Center, Unites States of America

1 Overview

Argo is a major component of the global ocean observing system which will ultimately consist of an array of 3,000 free-drifting profiling floats. Floats are deployed by Argo principal investigators who transmit data from their floats every 10 days to a national Argo Data Assembly Center (DAC), which aggregates the data and sends it forward to the two Global Data Assembly Centers (GDACs) (in Brest, France, and Monterey, California) from which the NODC acquires the data for archiving.

The NODC operates the long-term, also known as the Global Argo Data Repository (GADR), for Argo data. The objectives of the GADR are:

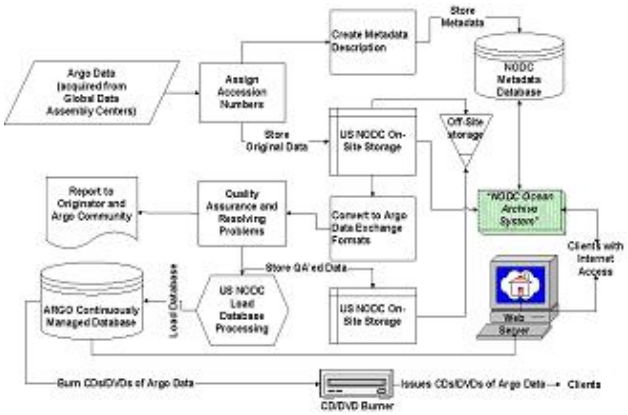
- to safeguard versions of the Argo data and information;
- to provide high quality Argo data to a wide variety of users in a timely and useful manner.

2 System operating procedure

The NODC has developed standard operating procedures (SOP) for processing Argo data. The SOP can be divided into four basic steps: data acquisition/accession, data ingestion, data quality control, and data distribution.

The NODC has developed, tested, and implemented an automated procedure, called "Argo-DataAgent" for acquiring, ingesting, and distributing Argo data. The following figure is a schematic diagram which depicts the conceptual design of Argo data flow after arriving at the NODC.

The following sections briefly describe the data processing procedures at the NODC.



2.1 Data Acquisition/Accession

The first phase in a series of procedures of processing Argo data at the NODC begins with downloading Argo data from the U.S. GODAE (Global Ocean Data Assimilation Experiment) Argo server in Monterey, California. This phase of data acquisition is automatically invokes ArgoDataAgent at 00:00 UTC every day. ArgoDataAgent logins into the server as an anonymous and looks for an Argo daily data file, named as "yyyymmdd_prof.nc" in the"latest_data/yyyy/mm/" subdirectory of the sever's "pub/outgoing/argo" directory, where "yyyy" is the four-digit year, "mm" is the two-digit month of the year in the range 01 to 12, and "dd" is the two-digit day of the month in the range 01 to 31. If the Argo daily file is not available at the login time, the ArgoDataAgent automatically generates an e-mail message and sends it to the Argo data manager at the NODC. The manager then investigates the cause(s) of the failure and take actions accordingly. The ArgoDataAgent also updates (replaces) Argo float's metadata, trajectory, and technical data residing in the "dac" directory and its subdirectories, if the data files are newer at the server than those residing in the GADR. Argo daily data files are "tarred" and "zipped" (compressed) into a single archive every week. An accession number is assigned to each weekly archive. Argo data in the "dac" directory and its subdirectories are automatically "zipped" and "accessioned" into a single monthly archive. An accession number is also assigned to such monthly archive. Both weekly and monthly archives are stored in the NODC mass storage device.

2.2 Data Ingestion

Argo data acquired from the US GDAC are in the netCDF format as specified in the Argo User's Manual (http://www.ifremer.fr/coriolis/cdc/argo/argo-dm-user-manual.pdf). Great care is taken to reconstruct the US GDAC netCDF format into the Argo GADR (NODC) netCDF format. The reconstructed netCDF format preserves all original metadata information and measured parameters as well as conforms with the netCDF conventions commonly used by Cooperative Ocean/Atmosphere Research Data Service (COARDS).The GADR netCDF format is fully compatible with ncBrowsẹa Java application that provides flexible, interactive graphical displays of data and attributes from a wide range of netCDF data file conventions. To encourage wider use of Argo data we have developed a utility program that extracts the values of observation location, time, measured parameters, and the associated quality-control flags from the original netCDF files and saved them in the tab-delimited spreadsheet text format (compatible with Java OceanAtlas and Ocean Data View).

2.3 Data Quality Control

The NODC does not perform any quality control (QC) procedure on Argo data downloaded from the US GDAC. All data has been passed the standard automated real-time QC procedure performed by each Argo data center. All QC flags are preserved in their original forms at the NODC.

2.4 Data Distribution

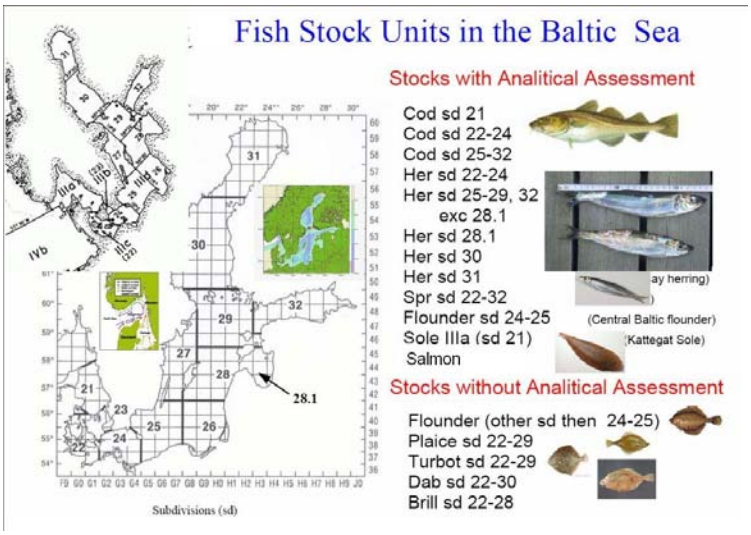
Currently, the NODC serves Argo daily data in the Argo GDAR netCDF and tab-delimited spreadsheet text formats to the public through the NODC Web site at http://www.nodc.noaa.gov/argo/index.html. The original Argo GDAC netCDF files are available off-line at users' request.

UE Program for collection of fisheries data for 2005 (Polish example)

Ryszard Grzebielec – Sea Fisheries Institute, Poland

Since 1 January 2005 Poland entered to EU Program for collection of the fisheries data and Sea Fisheries Institute in Gdynia is coordinator of the program in polish side. The presentation displays of the data defined in Regulation (EC)No 1639/2001 and specified in 9 modules by Codification Standard Document.

Polish national program 2005 in its biological part should be filled by data from 227 samples taken at sea and/or harbours. It means the measurement of 15,600 fishes and the analysis of 10,500. Additionally data for discards should be taken from 90 samples at sea including 4,500 measurements and 2,250 analyses. Sampled data are storing in existing database and will be in future transferred to new database. New database will be ready to receive request for data from EU DG-Fish IT system, and sent answer using XLM scheme. Diagrams are presented.



Integrated Oceanographic database

Siegrid JANS – Management Unit of the Mathematical Models of the North Sea (MUMM), Belgium

A brief overview of the database system will be presented.

The status of the data sets import will be explained, distinguishing the data types such as water, biota, air, sediment, optical and biodiversity. During the first years of the project, the team focused mainly on water data: physico-chemical analyses, nutrients, metals, PCB's concentrations…

The database was developed from the ecosystem approach and the aim was to include all the data types in the same structure.

Sediment, biota and optical data were therefore also imported in the database.

Now, the import process has been improved and more and more data are imported, such as many biota/biodiversity data, allowing the number of data in the DB to reach the 200.000 values.

The elaboration of a common layout for reporting the data has not only allowed a faster import but also better data quality:

- The data originator can directly see what meta-information is necessary/mandatory
- The files are structured nearly as they will be imported in the database, allowing swift coherence checks
- Number of requests for understanding and validating the data to the data originator is reduced
- Can be used as exchange format between the partners of a project.

Finally, data retrieval will be explained and demonstrated, using the query interface and the spatial tool.

The spatial tool has been improved by a new functionality: an interactive background map in a Geographic Coordinate System (European Datum 1950, in decimal degrees) is now available allowing the users to add its own layers without reprojecting them.

Scientific data management in CEFAS

Al Joyce – Centre for Environment Fisheries and Aquaculture Science (CEFAS), United Kingdom

New developments* in scientific data management are underway within CEFAS, driven by the CEFAS 'Data Management Policy' and the Defra 'Joint Code of Practice'. CEFAS is also integrating efforts through the Marine Data and Information Partnership (MDIP) which provides a framework for managing marine data and information across UK organisations. This will form a common basis for finding information, mapping, access and uptake using the internet. In the future, all government research contracts in the marine area led by Defra will be required to be deposited in approved Data Archive Centres, e.g., CEFAS.

**An interactive mapping tool, Interactive Spatial Explorer and Administrator (ISEA) is now available through the CEFAS website which provides online access to environmental and fisheries data for the UK shelf and beyond, to promote re-use and enhance the quality of data.*

Metadata developments at BSH/DOD

Friedrich Nast – Bundesamt für Seeschifffahrt und Hydrography, Deutche Oceanographice Dataen Zentrum (BSH/DOD), Germany

Submission of ROSCOP/CSR's to the ICES data centre steadily declined in the 1990s. On the other hand the EC recognized CSR's as a qualified tool.

- Bridging the end of a cruise and publication of results within the end to end data management concept;
- Bringing cruise results to a broad knowledge;
- For data tracking as in Germany.

Therefore the EC worked through the Sea Search project to enhance the submission of CSR's by:

- development of an online entry tool;
- development of a new retrieval tool;
- standardisation and harmonisation of these metadata with others such as EDMED, EDMERP and EDIOS, and by widening the area coverage to cruises from the Mediterranean and the Black Seas.

This above-mentioned task was taken over by the BSH/DOD within the Sea Search project. Within two years, more than 1200 CSR forms where submitted to ICES, marking the success of this initiative. At the end of the Sea Search project, BSH/DOD and the Sea Search partners will continue to use the system helping to further increase the submission of ROSCOP/CSR's.

A good cooperation with ICES is necessary. Up till now CSR databases at BSH and ICES are mirrored. This includes the opportunity to have online corrections to already existing forms thus improving the quality of ROSCOP/CSR forms. To work jointly on the content such as codes and sea areas as well as including XML tags or annexed information.

IOPAS Involvement in EUROCEAN Portal, Interactive map for access to information on coastal research vessels

Slavomir Sagan – Institute of Oceanology Polish Academy of Sciences (IOPAS), Poland

EurOcean (http://www.eurocean.org/) is a joint initiative of the Portuguese Science and Technology Foundation (FCT), Portugal and IFREMER, France. It started in 2003, with the aim to set up the Internet portal - a focal point for information on marine science and technology.

In 2004 EurOcean was joined by The Flanders Marine Institute (VLIZ), Belgium, Marine Institute, Ireland, Institute of Marine Research (IMR), Norway and Institute of Oceanology of the Polish Academy of Sciences (IOPAS), Poland.

One of the tasks of EurOcean is to build a database on the coastal and high seas research vessels. This is being developed with close cooperation with Oceanic Information Centre of the University of Delaware which maintains International Research Ship Schedules and Information Pages, (http://www.researchvessels.org/) and with European Research Vessel Operators (ERVO) and International Ship Operator Meeting (ISOM). The main part of that task is to include to the Oceanic database information on the European coastal research vessels (<30 meters length). Such information so far was not available in existing WWW services. EurOcean performed a survey among the small vessel operators, and appropriate data were included to Oceanic. IOPAS task was to develop an interactive map for access to information on coastal research vessels. (temp. address http://ocean.iopan.gda.pl/corveo/). The map serves as a user front-end to the Oceanic database. It allows to pick up the vessel's home port, area or country of interest. The user can also search though the defined criteria. After the query is performed, Oceanic web page with requested information is displayed to the user.

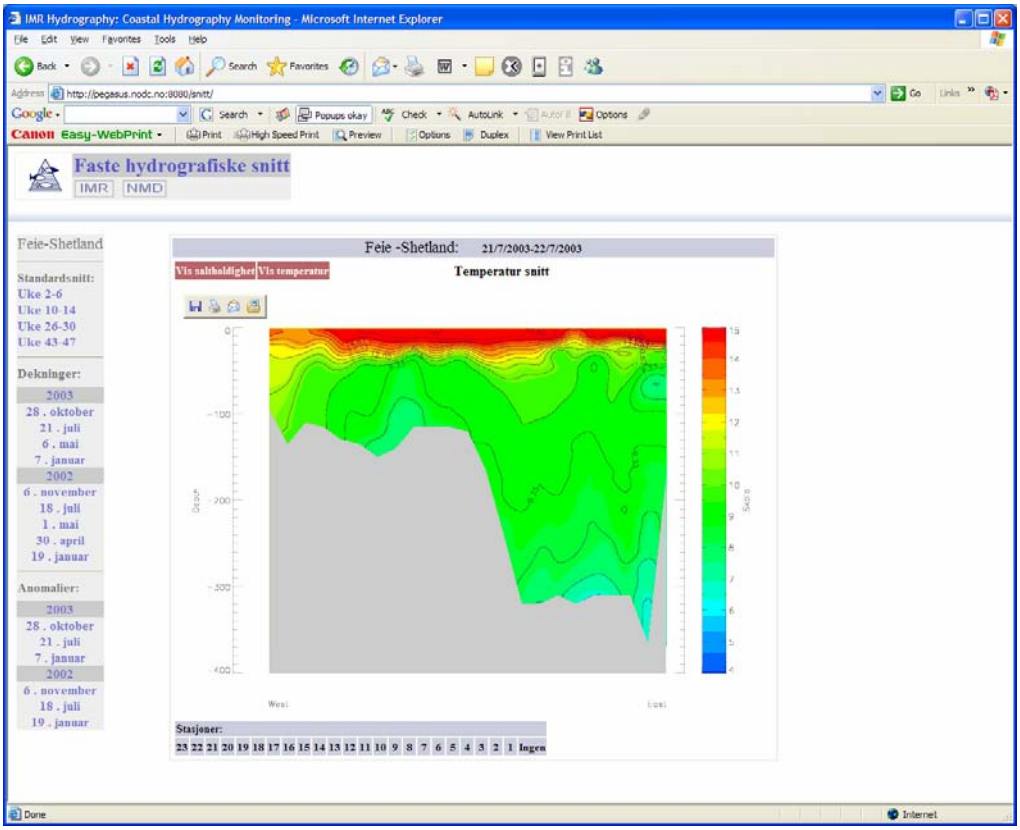
After completing the task, the map service will be transferred to the EurOcean web page.

Fixed hydrographic sections online on Internet

Helge Sagen – Institute of Marine Research (IMR), Norway

H. Sagen presented the latest developments of the Norwegian Marine Data centre, NMD web pages. A visualization system has been made available to researchers. The system lets the user choose a section, a standard section or anomalies to visualize. Both salinity and temperature contour plots are available. The standard section is calculated from previous coverage of the section and has measured values and statistical values at 5 meter intervals. The system is based on HTML, PHP and IDL graphics from Research System Inc. RSI, UK, http://www.rsinc.com/.

NMD is working on putting all the Institute of Marine Research, IMR sections available online using the visualization tool developed. At the moment only a few sections are available, like "Feie – Shetland" The anomalies are only present if one has a certain amount of data available to calculate the anomaly. Typically week 2–6 and week 10–12 has an anomaly, but week 7–9 has no values due to no underlying data.



Data assimilation in the HIROMB model

Jan Szaron – Swedish Meteorological and Hydrological Institute (SMHI), Oceanographic Unit, Sweden

HIROMB (HIgh Resolution Operational Model for the Baltic Sea) is the operational ocean circulation model at SMHI. A number of other governmental agencies around Baltic are also using HIROMB in their daily operational oceanographic work.

HIROMB is a three-dimensional baroclinic model forced mainly by the atmospheric circulation model HIRLAM .

For the freshwater inflow, daily data from the river runoff model HBV is used. At the outer open boundaries a storm surge model (NOAMOD) is used for the water levels together with tides, climatologic salinity and temperature data.

HIROMB makes forecasts of water levels, currents, salinity, temperature, ice thickness, ice concentration and ice drift.

More information on HIROMB can be found on
http://www.smhi.se/oceanografi/oce_info_data/models/hiromb.htm
and on http://www.ymparisto.fi/default.asp?node=15559&lan=en (7th HIROMB-Scientific Workshop, 7–9 December 2004, Helsinki, Finland).

Data assimilation is an important way to further improve and advance the work on HIROMB. SMHI is conducting almost monthly monitoring cruises in Eastern Skagerrak, the Kattegat, the Sound, and the Baltic proper. Temperature and salinity profiles as well as underway sea surface temperature (SST) data are sent to HIROMB from the R/V Argos every 1–2 days. Analysed fields of SST are produced twice a week and included in the HIROMB assimilation.

Temperature and salinity data from the buoys Läsö E and Huvudskär E are used for model validation.

MarBEF Data management

Edward Vanden Berghe – Flanders Marine Data and Information Centre, Flanders Marine Institute , Belgium

MarBEF, Marine Biodiversity and Ecosystem Functioning, is an EU Network of Excellence, funded for a period of five years. It is the first Network of Excellence to be operational, and will last till early 2009. The Network itself is very large, with initially 56 partner institutes, and nearly 600 research scientists covered. In a Network of Excellence, funding is mainly for integration of research, not for research itself. Some of these integrating activities are a joint training programme, outreach, a taxonomic clearing system, and QC/QA. One of the largest work-packages is data management.

Three data systems of the MarBEF data management programme were discussed: a gazetteer, the European Register of Marine Species (ERMS), the European Node of the Ocean Biogeographic Information System (EurOBIS).

The gazetteer will incorporate all major lists of marine places/features, such as IHO, ASFA. Apart from position os a point, also polygons and lines can be stored, to allow building map interfaces on the gazetteer, and on applications that will make use of the gazetteer as a geographic reference. The map interface is being developed, and will make use of Scalable Vector Graphics.

The European Register of Marine Species was the end-result of another EU project, which ended 2000. The MarBEF data management team has now taken responsibility over the register, and is facilitating an update of its content. The content is delivered by a consortium of over 70 taxonomists, most the leading specialists in their field. This makes ERMS an authoritative register, nor just another desk exercise. The intellectual property right of the consortium of taxonomists is the responsibility of the Society for the Management of European Biodiversity Data (SMEBD), who represents the taxonomists in various for a, and has invited MarBEF to manage the register.

The European Node of the Ocean Biogeographic Information System, EurOBIS, is a distributed system delivering biogeographical records through a web interface, both directly to the end user, and through the international OBIS portal, and through the Global Biodiversity Information Facility. Both the Gazetteer and ERMS are used as standard lists to support data integration.

Another activity in which the MarBEF data team is involved is data archaeology and rescue. Too often, data are lost because the last person having the knowledge about the data, or the information on how to interpret the data is disappearing. In order to counter this problem, MarBEF is actively contacting custodians of marine biodiversity data, and collaborate with them to store the data in a secure archive. This archival does not necessarily imply redistribution, only long-term preservation of the physical integrity of the data files.

Finally, some general principles were discussed, and their application by the MarBEF data management team. One of the most important points is to try and build on existing initiatives, rather than to build systems from scratch. Distributed systems are seen as a good way forward: the become more and more easy to build, give the end user access to the most recent information, and allow the data custodian to remain in charge of the data. But distributed systems make it even more important to agree on protocols, and on shared vocabularies (such as gazetteer and species lists) to facilitate integration of the different component datasets.

IOPAS Marine Data Bank

Marcin Wichorowski – Institute of Oceanology Polish Academy of Sciences (IOPAS), Poland

For the last three years IOPAS gained progress with the data management procedures and technology. The IOPAS Marine Data Bank is being developed using the open source and GNU products, especially Linux, Apache, MySQL, PHP as a data storage and delivery platform or ArgoUML as a designing tool. This approach guarantee chip and robust platform for collecting the datasets. IOPAS develops its own tools for data processing as well. Datasets are being imported to the database using this tools systematically. Quality check procedures are applied during this process.

The next step is to develop XML output from the database and XSLT templates to deliver required data to the users.

Slides from Pekka Alenius on sealevel forecast at FIMR

Operational sea level forecasts in FIMR

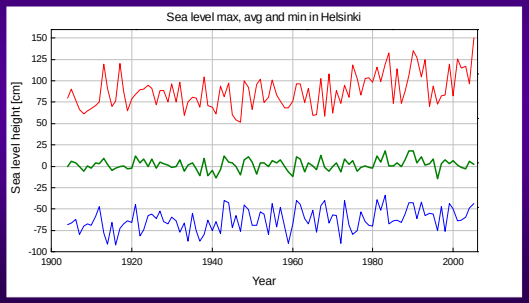
Pekka Alenius
Finnish Institute of Marine Research

1

Background ...

- Regular sea level observations since 1887
- 13 stations along the coasts of Finland
- Sea level modelling since mid 1970's
- Operational forecast as a test in 1980's (nobody wanted to pay for service)
- Operational model in use in 2000's (no forecasts published)
- Operational forecasts from 15. Jan. 2005 in the web (in Finnish only)

2



3

Background ...

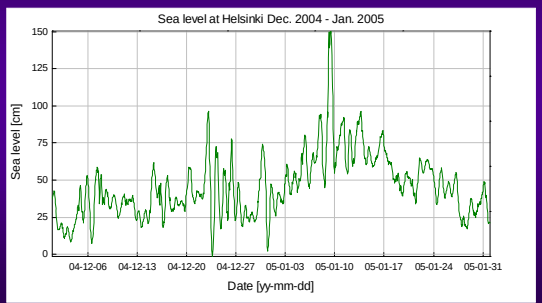
- East-Asian tsunami 26.12.2004 increased avareness of environmental hazards
- Semi-active looks at model results in FIMR
- On Friday 7. Jan. 2005 noticed a coming exceptional event and a warning was given to authorities (prognosis: water level in nHelsinki may rise to +150 cm, previous record ws +136 cm above theoretical mean sea level (observations since 1904 in Helsinki)

4

Background

- In the morning 9. Jan 2005 water level in the Gulf of Finland began to rise fast
- Sea level rose to +151 cm
- The authorities were prepared thanks to the given warning
- The event had long duration (12 hours), 11 highest hourly values ever measured were from this day

5



6

Present system ...

- Daily written forecasts were started on 15. Jan. 2005
- Five different model runs every 6 hours automatically
- Forecast written once a day into internet
- In case of extreme events a warning is given to relevant authorities

7

Present system

- Finnish Meteorological Institute HIRLAM atmospheric model winds used in three model versions
- ECMWF winds used in two model versions
- SMHI and BSH sea level model results are available for look as background information (BOOS co-operation)

8

Interactive sea level tool

- MySQL data base for hourly water level values (original data today comes real time in one minute intervals)
- Home made interactive software for data retrieval and lookup
- Software collects model results from FIMR, BSH and SMHI and shows on an interactive figure together with real data

9

Forecasting

- The interactive tool shows data and model results in ”editable” form in same figure by
  - sea level station
  - sea area
- The forecast is written as text into web pages by web-page tool

10

The end

11

Annex 7: Proposed TORs for WGMDM 2005/2006

The **Working Group on Marine Data Management** [WGMDM] (Co-Chairs: Michèle Fichaut, France and Helge Sagen, Norway) will meet in Madrid, Spain, from 8-10 May 2006 hopefully back to back with SGMID to:

a) Quality assurance/control procedures - Identify and compare existing quality control and quality assurance procedures for integration of physical, chemical and biological data in use at WGMDM member organizations, and recommend common standards and procedures to ICES and IOC/IODE. (Action Plan 4.12, 6.1);

b) Data type guidelines - assess the continuous development and updating of an accurate list of best data collection guidelines and to recommend on encouraging the use of the guidelines by the scientific community. (Action Plan 4.12, 6.4);

c) Taxonomy issues - Improve usefulness of the Integrated Taxonomic Information System (ITIS) to the marine community and actively promote ITIS within the ICES and IOC community. (Action Plan 6.4);

d) Operational Oceanography issues - Critically assess the data management practices in place in WGMDM member organisations in support of Operational Oceanography. (Action Plan 5.13.4);

e) XML – extended Markup Language - Evaluate and develop future directions for oceanographic Marine Data Exchange Systems using XML at the national and international level. (Action Plan 5.13.4, 6.1);

f) GIS Geographical Information Systems - Critically examine the use of GIS in marine data systems in WGMDM member countries, especially to investigate the use of Open Source GIS as compared to commercial ones like ESRI. (Action Plan 1.10, 6.1, 6.2);

g) Future structure – Merge the WGMDM with the SGMID into a new group of data managers, users and scientists called the Working Group on ICES Data and Information Management. The mission of the new group will be to:

- to advise ICES on data management issues
- to promote good data management practice within ICES
- to give guidance to the ICES Data Centre
- to liaise with relevant international data management bodies and programmes (IODE, GOOS, SeaSearch/SeaDataNet, etc.)

The Terms of Reference for the group are a mixture of WGMDM and SGMID ToRs. The Working Group on ICES Data and Information Management will be positioned directly under the ICES Bureau, but will report to the Science Programme through Oceanography Committee and to three advisory Committees (ACE, ACME, ACFM) and the Annual Science Conference or in-between whenever appropriate. (Action Plan 5.15, 6.1);

WGMDM will report by 5 June 2005 for the attention of the Oceanography Committee.

Supporting Information

Priority:	This Group flies the flag for ICES in setting standards for global databases. It also provides an important interface for oceanographic and environmental data management in ICES, and promotes good data management practice.
Scientific Justification and relation to Action Plan:	Action Plan 4.12, 6.1 a) Considerable inter-sessional effort will be made on promoting the data type guidelines. This effort will be assessed and feedback from other groups and organisations will be evaluated. Such feedback will help to establish future guideline activity. The operational oceanography and coastal data systems need to establish good data management practices and quality control routines. Action Plan 4.12, 6.4 b) This will encourage standardization of approach in management and quality control across a broad spectrum of data types and to promote best practice in data management. The inclusion of a list of 'other' guidelines will broaden the view on existing guidelines. Action Plan 6.4 c) The ITIS can play a major role in standardization and improving the ease of data exchange. It is an evolving partnership that requires input from (new) collaborators whilst maintaining community standards. The ITIS should be actively promoted with the communities and groups encouraged to feed in their information. Action Plan 5.13.4 d) As GOOS activities develop it is essential that the modern marine data management systems are in place and utilized effectively. This will serve to assess established systems and recommend best practice for data management for operational oceanography. A list of web sites distributing operational data will be established to support the existence of operational oceanography sites. Action Plan 5.13.4, 6.1 e) The data management community must explore the use of new technologies, such as XML, in a broader context. The WGMDM will evaluate and develop future directions for ocean Marine Data Exchange Systems using XML. The efforts made by SGXML should be followed within the broader context of general oceanographic data flow. Action Plan 1.10, 6.1, 6.2 f) The use of GIS is becoming increasingly important for the marine community. The potential benefits (and problems) of this technology will be examined, especially to investigate the use of Open Source GIS as compared to commercial ones. Action Plan 5.15, 6.1 h) Establishing data integration is a step in developing the scientific basis for an ecosystem based approach to management. This is of high priority to ICES. Good data management practice is required to ensure the underpinning databases are as complete and as high quality as possible. Data management expertise from WGMDM will complement user requirements from SGMID when merging the two groups. The new group will contribute to establish relationships with international marine science organisations and science projects like IOC/IODE, EU SeaSearch/SeaDataNet.

Relation to Strategic Plan:	Scientific objectives of understanding marine ecosystems must be underpinned by good and up-to-date data management practices and procedures. Specifically, the WGMDM supports various elements of Goals 4, 5 and 6
Resource Requirements:	None
Participants:	Core Group of members of national oceanographic data centres ensure well attended meetings.
Secretariat Facilities:	None, apart from preparation of material by the Data Centre Manager
Financial:	The Data Centre Manager or other people working at the Data Centre should attend this meeting
Linkages To Advisory Committees:	Report is seen by ACME
Linkages To other Committees or Groups:	None, but links should be encouraged to broaden the scope of the group to more generic data management issues
Linkages to other Organisations	IOC, especially its Working Committee on International Oceanographic Data and Information Exchange (IODE)

Annex 8: WGMDM action list 2005/2006

No.	Action item	Who
1	Distribute the ICES User Survey among the MDM members	J. Gillin
2	Fill in the ICES survey to test it and report about it	All members
3	Report the results of the discussion between WDC and ICES about how they could cooperate more efficiently	J. Gillin and R. Gelfeld
4	Tidy up the Yahoo-group pages, and get the photos from there	G. Evans
5	Set up the local MDM pages at BODC Web pages	G. Evans, B. Gelfeld, M. Fichaut, S. Almeida
6	Synthesize the result of the list of CDROMS and products and put it on MDM Website	G. Evans
7	Give comments on the MDM pages that will be set up at BODC	All members
8	Circulate the information on the theme session on Data Management of the ASC in the WGMDM as soon as it will be available on ICES Website	Chairs
9	Prepare contribution to the theme session on Data Management at the ASC in September 2006	All members
10	Prepare a new poster on MDM activities	Chairs
11	Continue to promote the MDM guidelines and ensure all MDM members have links to the MDM guidelines	All members
12	Revises the MDM guidelines: Moored ADCP (H. Sagen), Moored current meters (G. Slesser), Shipborne ADCP (M. Fichaut), Seasor (G. Dawson), Surface underway (M. Fichaut), Water Level (M.J Garcia), Xbt (G. Dawson), Net tow (G. Evans), Surface Drifting Buoy (S. Tomlinson), Profiling Float and Drifting Buoy (S. Tomlinson and M. Fichaut) when merging CTD and Discrete water sample guidelines one must take into account the results of the CTD questionnaire (L. Fyrberg, G. Dawson, T. de Bruin)	All members
13	Request ICES Secretariat and Working Groups to make links to the guidelines on other relevant ICES Web pages (i.e. Fisheries)	Chairs
14	Request ICES Secretariat to make available the list of identified guidelines provided by WGMDM	Chairs
15	Monitor the internet access to the guidelines at the ICES web site and report back.	ICES
16	Update the poster on MDM guidelines for the theme session on Data Management of the ASC in 2006 and write an abstract for the guidelines poster	R. Gelfeld, G. Evans
17	Produce a summary of the results of the CTD questionnaire	T. de Bruin, M. Wichorowski
18	Produce a new poster presenting the results from the CTD questionnaire and present it on the ASC either 2006 or 2007	T. de Bruin, M. Wichorowski
19	Request comments from the Oceanic Hydrography WG and the OCC (Oceanography Committee) on the summary of the CTD questionnaire on merging CTD and water sample (chairs)	Chairs
20	Request IODE-GE-BICH to cooperate on identifying guidelines on biodiversity	E. Vanden Berghe

NO.	ACTION ITEM	WHO
21	Check that everything in the guidelines has a place in XML structure	E Vanden Berghe, M. Wichorowski, R. Gelfeld
22	Develop an accurate list of best data collection guidelines building on the work of the 'other guidelines list' and the list of MDM guidelines and keep the list updated and available through internet access	T. de Bruin, E. Vanden Berghe, G. Evans
23	Continue to submit links to web site where member institutes makes OO data and products available and send it to J. Szaron. He will review the list and send it to G. Evans for the MDM Web site	Members that didn't send their list, J. Szaron, G. Evans
24	Contact WGOH (Sheldon Bacon) to inform them on the list of OO that MDM is producing	Chairs
25	Investigate the QC procedures used in OO like in ARGO, COOP, GOSUD	L. Rickards, G. Evans, M. Fichaut, MJ. Garcia
26	Report back to WGMDM the discussions of the IOC MarineXML Steering Group	M. Wichorowski, Chairs
27	Evaluate and document XML work at the national level as a mechanism for the efficient exchange of oceanographic data	All
28	Contact SGMID for the back to back meeting next year - or contact them for possible merge of WGMDM and SGMID	Chairs
29	Investigate the use of Open Source GIS as compared to commercial ones (ESRI)	S. Jans, M. Wichorowski, M. Fichaut, H. Sagen, E. Vanden Berghe
30	Report on WGMDM members contribution of underway data to the GOSUD project	All
31	Overview of ongoing projects in which MDM members could participate as GOSUD, ARGO, …	T. De Bruin
32	Check that EuroGOOS and ICES have some agreement on EDIOS	M. Fichaut
33	Send current meters inventory to BODC	H. Sagen, H. Parner, S. Jans, T. de Bruin, E. Vanden Berghe
34	Send IBTS data as soon as possible to ICES to support NORSEPP program	H. Sagen, J. Szaron, M. Fichaut, A. Joyce, T. de Bruin

Annex 9: Action Plan Review Progress

Year	Committee Acronym	Committee name	Expert Group	Reference to other committees	Expert Group report (ICES Code)	Resolution No.		
2004/2005	**OCC**	**Oceanography**	**WGMDM**		2004:\C:07	2C07		
Action Plan	**Action Required**	**ToR's**	**ToR**	**Satisfactory Progress**	**No Progress**	**Unsatisfactory Progress**	**Output (link to relevant report)**	**Comments (e.g., delays, problems, other types of progress, needs, etc.**
No.	**Text**	**Text**	**Ref. (a, b, c)**	**S**	**0**	**U**	**Report code and section**	**Text**
4.12, 6.1	Please see Action Plan items below.	Identify and compare existing quality control and quality assurance procedures for physical, chemical and biological data in use at WGMDM member organizations, and recommend common standards and procedures to ICES and IOC/IODE;	a)	S				The Guidelines were developed to provide consistent advice for managing and exchanging data, including provision of services to users. The present guidelines are complete and consistent and have been promoted to other groups, including IOC/IODE. Considerable inter-sessional effort will be made on promoting the data type guidelines. This effort will be assessed and feedback from other groups and organisations will be evaluated. Such feedback will help to establish future guideline activity.
6.4	Please see Action Plan items below.	Improve usefulness of the Integrated Taxonomic Information System (ITIS) to the marine community and actively promote ITIS within the ICES and IOC communities;	b)			U		The ITIS can play a major role in standardization and improving the ease of data exchange. It is an evolving partnership that requires input from (new) collaborators whilst maintaining community standards. The ITIS should be actively promoted with the communities and groups encouraged to feed in their information. ITIS is the largest, most well organised list of Taxonomic codes and thus has become a de-facto standard, a contributor to the Global Biodiversity Information Facility (GBIF) and recommended by ICES, IOC/IODE and GE-BICH. One of the main advantages of using ITIS was to have a standard list of well-researched names, but it has a North American, non-marine taxa focus. The speed with which non-North American names are added is hampering the use of ITIS as a reference list of names. One of the solutions could be for ITIS to accept lists from other organizations.

Year	Committee Acronym	Committee name	Expert Group	Reference to other committees	Expert Group report (ICES Code)	Resolution No.
2004/2005	OCC	Oceanography	WGMDM		2004:\C:07	2C07

Action Plan	Action Required	ToR's	ToR	Satisfactory Progress	No Progress	Unsatisfactory Progress	Output (link to relevant report)	Comments (e.g., delays, problems, other types of progress, needs, etc.
No.	Text	Text	Ref. (a, b, c)	S	0	U	Report code and section	Text
5.13.4	Please see Action Plan items below.	Critically assess the data management practices in place in WGMDM member organisations in support of Operational Oceanography;	c)	S				As operational oceanography becomes increasingly important, WGMDM recommends that well known and recommended data management procedures are implemented. WGMDM will examine currently available procedures and recommend best practice for operational oceanography in the coastal ocean. In addition, WGMDM will provide links to relevant data and products produced by their centres and investigate the quality control procedures used in established Operational Oceanography projects. As GOOS activities develop it is essential that the modern marine data management systems are in place and utilized effectively. WGMDM will examine various issues including metadata directories, developments for quality control, referral mechanisms, products (climatologies), data stewardship, etc.
5.13.4, 6.1	Please see Action Plan items below.	Based on the final report and results of the SGXML, make recommendations regarding adoption of the use of XML in the oceanographic community.	d)	S				The ICES/IOC Study Group on the Development of Marine Data Exchange Systems Using XML (SGXML) concentrated its efforts on metadata standards, parameter dictionaries and generic data structures. It soon appeared that XML is an excellent tool for metadata, but not for distribution of physical oceanographic data. Biological data, which is by nature more verbose, is successfully exchanged by among others OBIS and GBIF. At the IODE XVIII meeting, it was decided that future XML work and development would continue through the establishment of a MarineXML Steering Group. Some members of WGMDM will participate in the work and keep the rest of the group updated. The WGMDM will attempt to integrate the efforts of SGXML into this broader context and develop possible directions for ocean data management in a distributed environment.

Year	Committee Acronym	Committee name	Expert Group	Reference to other committees	Expert Group report (ICES Code)	Resolution No.
2004/2005	OCC	Oceanography	WGMDM		2004:\C:07	2C07

Action Plan	Action Required	ToR's	ToR	Satisfactory Progress	No Progress	Unsatisfactory Progress	Output (link to relevant report)	Comments (e.g., delays, problems, other types of progress, needs, etc.
No.	Text	Text	Ref. (a, b, c)	S	0	U	Report code and section	Text
6.1	Please see Action Plan items below.	Review the report of the Study Group on the Management of Integrated Data (SGMID), and recommend strategies and solutions for data integration, distributed database systems and data distribution policy at the ICES Secretariat;	e)	S				Establishing data integration is a step in developing the scientific basis for an ecosystem based approach to management. This is of high priority to ICES. Good data management practice is required to ensure the underpinning databases are as complete and as high quality as possible. WGMDM suggests to merge SGMID and WGMDM where data management expertise from WGMDM will complement user requirements from SGMID. The two groups will benefit from meeting back to back next year to agree on the future. Possible new mission: i) to advise ICES on data management issues ii) to promote good data management practice within ICES iii) to give guidance to the ICES Data Centre iv) to liaise with relevant international data management bodies and programmes. The Working Group on ICES Data and Information Management might be positioned directly under the ICES Bureau, but will report to the Science Programme through Oceanography Committee and to the three advisory Committees.
6.1, 6.2	Please see Action Plan items below.	Critically examine the use of GIS in marine data systems in WGMDM member countries, and make recommendations as to the use of GIS.	f)			U		The use of GIS is becoming increasingly important for the marine community. The potential benefits (and problems) of this technology will be examined and recommendations made on best practice and use of GIS. WGMDM recommends the use of GIS, but acknowledge the need to investigate on Open Source software such as MapServer and to look into existing standards before making further specific recommendations. However, WGMDM can already recommend the use of standards such as ISO-19115 for the Metadata and OpenGIS for the diffusion of geographic objects, Web Map Services (WMS).

Action Plan Numbers relevant to WGMDM ToRs:	
4.12	Review and advise on procedures for quality assurance of biological, chemical and physical measurements. [OCC/MHC/ACME]
5.13.4	Contribute expertise and know-how for the development of modern marine data management systems and maintain such systems that are of relevance to ICES activities.
6.1	Integrate and expand databases to support ICES programmes within a well-defined data management policy. [CONC/MCAP/all Science Committees]*
6.2	Develop a cooperative framework for the production and exchange of scientific software for managing ICES information. [RMC/ACFM]
6.4	Assess and, where possible, improve, the quality of marine biological data. [LRC/RMC/OCC/DFC]